

# The Iron Age

A Review of the Hardware and Metal Trades.

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## ARCHITECTURAL IRON WORK.

*The Organization and Mechanical Management of a Foundry and Shops for the Manufacture of Iron Work for Buildings.\**

BY WM. J. FRYER, JR.

### PART I.—General Remarks.

Establishments devoted exclusively to the manufacture of iron work for buildings are of comparatively recent growth. Almost without exception, the larger ones now existing have grown from small beginnings, building after building having been added to the original shop until they became great workshops without proper plan for the economical working and handling of materials. Formerly there were two distinct divisions in contracting the iron work required for a building; the wrought iron work was given to a blacksmith, and the cast iron work to a foundryman. The custom now is to give the entire work to one establishment.

This branch of iron manufacture has increased enormously within the past fifteen years, and the probabilities are that the future will develop a still greater proportional growth. It is a common-place saying that as a nation we have but just begun to use iron. This is, indeed, very true as regards its use for building purposes. Good construction, economy of material and beauty of form in architectural iron work have made greater progress in this country, and particularly in the city of New York, than elsewhere in the world. A knowledge of the subject requires diffusion. Years of study, observation and hard practical toil were the price of the writer's thorough knowledge of this class of work, as it must be to every man who would qualify himself for this business.

The aim in giving publicity to this knowledge is largely for the enlightenment and advancement of the workman. They need to have placed before them in plain and intelligible forms an outline of how the works in which they daily toil are managed, and so to help educate up operative mechanics to become competent to command and control the coming great industrial workshops of our land.

To proprietors of works new light will be thrown on their business, and enable them more thoroughly to understand the principles which govern their every day doings. The knowledge herein imparted will enable a manufacturer to correctly ascertain what his products cost, and to establish prices which will allow fair profits. It is a general complaint that the cost of work almost invariably exceeds an estimate, and the yearly balance sheets too often indicate that a business has failed to pay a reasonable reward for the labor and use of capital employed. The cost of the various items given in the following pages will differ more or less in every establishment, but if the principles laid down will induce manufacturers of iron work for buildings to make similar statements of actual costs, in detail, applicable to their own shops, there will be little danger that their products will be sold without profit, or that the balance at the end of the year will be found on the wrong side.

The illustrated specifications of iron work, which will be given in a following paper, will be found of great practical advantage to architects and to all whose trade, profession or business connects them with this class of iron work.

### A MODEL SHOP.—LOCATION.

In selecting a site for the shops many essential things are to be considered. The land should have a water frontage on a navigable stream, be convenient to railroad depots and steamboat landings; have good telegraphic and mail connections, and be where skilled labor is easily obtained, and where homes for workmen are numerous. A good sized plot of ground is desirable, not alone for the immediate present, but to accommodate the future growth and requirements of the business. The land must be of moderate value, and selected with an eye to its prospective increase in value. Look ahead to a profit on the land purchase. It is well to have the location away from other shops in the same line of manufacture, so as to draw employees to the neighborhood and secure their permanency; and yet be not so far away as to greatly inconvenience temporary hands.

Selecting such a plot of ground, of a size not less than 300x250 feet, suppose its cost to be \$15,000.

### BUILDINGS.

The buildings will all be of brick and have slate roofs, and put up in a good and substantial manner. Their cost may be taken at \$40,000.

The shops are arranged in relation to each other as to ensure the least handling and inconvenience from the time the raw material is landed on the dock until the manufactured article is run out for shipment—one succession of advances. By reference to the plan it will be seen that the buildings form a hollow square. This secures the greatest amount of light and ventilation, the greatest security to

valuable materials, the least danger from destructive fire and the best control of the employees.

The engine and boiler are situated at the center, the power radiating to all quarters. The cupolas are placed at the center of the length of the foundry, and the run way for charging the same is in the yard. The foundry is 60x180 feet. A portion of it, 50 feet in length, is railed off for light work. The remainder, for heavy work, is furnished with four cranes. Sheds for sand run alongside the foundry, and the sand is thrown directly in as required. Two cupolas are provided, each with a maximum capacity of 20 tons, will enable a cast to be made every working day in the year without having to lay by during relining, &c. By using both at once sufficient iron can be melted for

where winters are severe to roof over the yard or court, taking care to provide as much light as possible and liberal ventilation. The roof can then be made use of for storage of small flasks and similar things. A stable, 30x50 feet, is placed where shown in the side yard. This yard gives space for flasks, cord wood, &c. The workmen in going out and in daily all pass through the entrance way alongside of the office. When being paid off they pass through the hall way and main office.

Enlarged capacity to the shops can be had by adding a wing on the foundry, covering more or less of the side yard. The erecting shop may have a gallery added, 15 feet wide, running around on all sides, suspended from the roof trusses, and used for vice work. In due time a two or three story building for storage of

lot of columns 12 inches in diameter and three-quarters of an inch in thickness are to be made at a given price—say, four cents per pound. Now, if these same columns were to be made 1½ inches thick, and the rate per pound was the same, the heavier weights would afford by far the best profit, because the cost in both cases are alike as to molding time and materials, cleaning, chipping, turning off ends, &c., and the heavier weights represent simply melted pig iron poured into the mold.

There is danger, however, of these facts leading a contractor astray and tempting him to take work too low. A limit must, therefore, be established; and when a man is steered to refuse work below that limit, and yet has the energy and ability to keep the shops well filled with contract work above that limit, good re-

establishment is supposed to represent \$150,000. Expenses will commence with the organization and go on unceasingly. These are to be taken into account and apportioned to the different shops. They become what will be termed shop expenses—so much on the foundry, so much on the finishing shop, etc., in proportion to the room they occupy.

The cost of castings in the foundry wants to be got at. To one unfamiliar with a foundry—perhaps to many familiar with a foundry—this would appear a very difficult task. And yet for a given month, if a record of the quantity and cost of the pig iron consumed, together with the sand, flour, wood, coal, and other supplies used, and the wages paid to molders, helpers, etc., be aggregated, and to this sum the shop expenses, before referred to, be added, and the total in dollars and cents be divided by the number of pounds of good castings weighed up coming out of the foundry during the month, it will give, beyond the shadow of a doubt, the average cost per pound of those castings. A little good judgment will separate those castings into three grades—heavy, medium and light, and the prices to correspond. So simple is the method when systematically pursued. A monthly record so kept will give the average daily consumption of materials and cost of labor to the ton of iron melted. It is also necessary to get at the exact cost per pound of any particular casting, large or small, and the method of doing this will be shown further on.

The same manner of record applied to finishers engaged in fitting up the castings will establish correctly the average cost per pound of finishing certain grades of castings.

In the blacksmith shop a record kept of the coal used, the wages paid, and the wrought iron cut up, will give the average cost per pound for forgings and smiths' work.

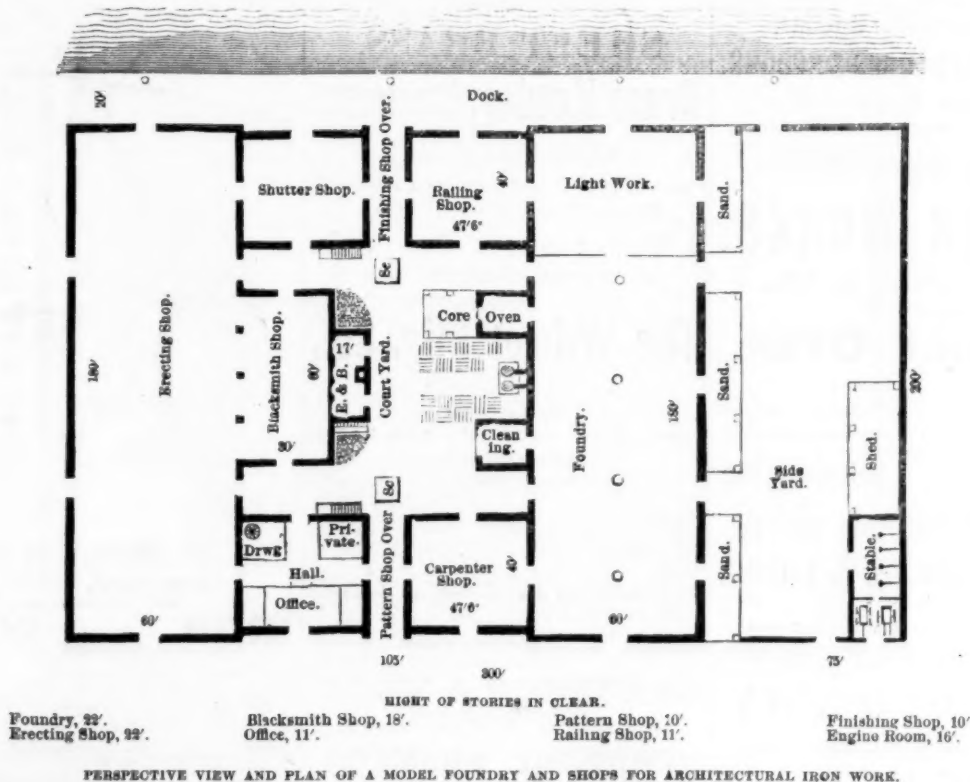
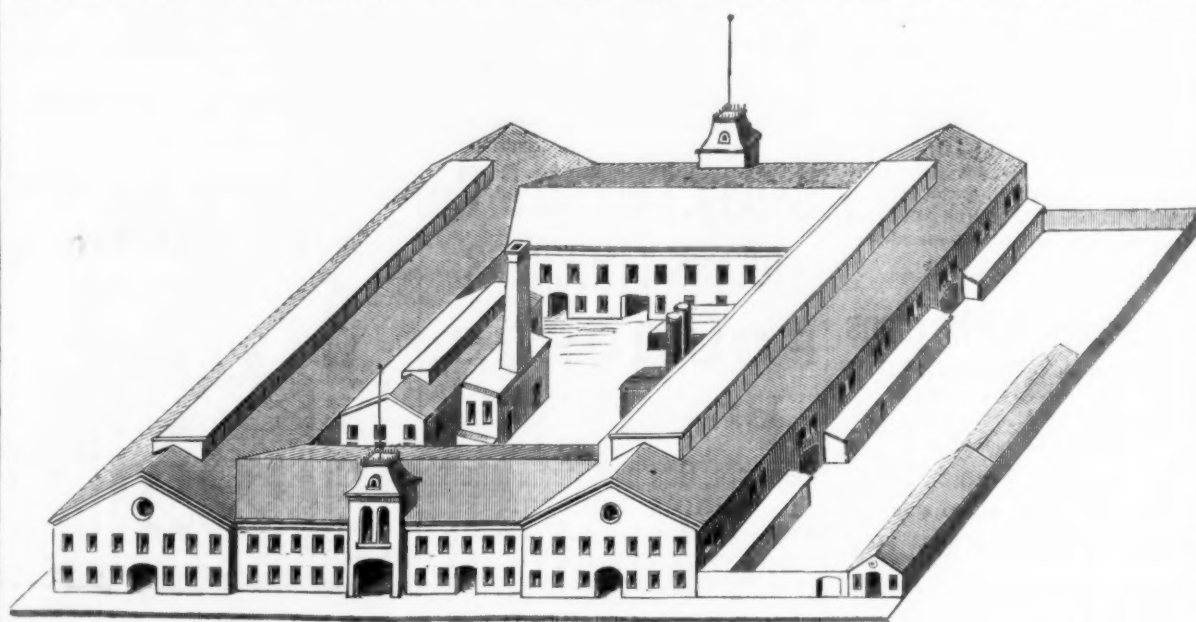
In the pattern shop the average cost of each man is obtained through this same principle. For certain classes of finished castings experience will determine the average cost per pound or per ton of pattern work, including pattern materials, such as lumber, hardware, etc.

Suppose an iron front to have been manufactured in the shop and set up at the building and finished complete. The cost has been kept at every stage, and it must now show all this: The total weight; the weight of the heavy castings, such as the columns and the pilasters; the weights of the light castings, such as the arches, cornices, sills, etc.; the cost of the castings as they came out of the foundry; their cost per pound of finishing in the shop; and the cost per pound of setting up and finishing at the building; the cost of painting; the total cost per pound and the total cost in dollars for the front; also the cost per square foot, superficial.

With records like this there is little room left for guess work. The lack of them accounts for the wide difference in bids from contractors, and affords an explanation for the disappointing results obtained at the end of a year's business on finding little or no profits made or actual losses incurred. Many concerns take work at losing prices through sheer ignorance of what the actual cost is. Every article in the business, and each particular contract, should be reduced in detail to its cost per pound, or per superficial foot, or both. Certain classes of work cost more for the finishing labor than the castings themselves cost. What would seem to be a large price per pound would not give back the manufacturer his money. A contract job may show a loss, or particular parts of it a loss. But future similar mistakes are thus guarded against. Be governed by facts, results actually obtained, and never be influenced by what a competitor takes work at, other than to impel a closer scrutiny into the correctness of the cost or a more economical manner of doing such work. Sooner or later those who defy the teachings of figures, as well as the teachings of experience, will come to grief.

The capital, investment in buildings and plant, and the financial management of such a foundry as that above described, will be considered in the following article.

The Rock Hill Iron and Coal Company, at Orbisonia, Huntingdon county, Pa., will blow in one of their new furnaces within a month. These furnaces (two) are among the most complete in the State, and are exactly alike. They are 17 feet at the boshes and 65 feet high. The engines have 90 inch blowing and 65 inch steam cylinders. One of the leading improvements in these furnaces is interchangeable power, gases, &c. This company mine their ores (hematite and fossil) from their mines within half a mile of the furnaces, running cars by gravity direct from the mines to stock house. Limestone is brought from quarries about four miles distant; the fuel is coke made by the Belgian ovens from the company's coal, mined at the terminus of the East Broad Top Railroad, 30 miles from the furnaces. About 450 tons of coal are shipped daily to the Eastern market in addition to what is required for use.



almost any purpose. The erecting shop, in which to lay down iron fonts and other work is 60x180 feet. The blacksmith shop is 30x60 feet, and opens out into the erecting shop, so that the latter may be used for purposes connected with the former. A finishing shop is made two stories in height, in which to make shutters, railings and fit up small work. The opposite building is also made two stories in height, a portion of its first floor being used for a carpenter and a flask making shop, and the upper story, 40x105 feet, for pattern making. The stairs thereto are on the outside of the building. On the first floor of this building is arranged the offices; a main counting room, a private office and a drawing room, the latter connecting with the pattern shop by a circular stairway. From the windows of the private office a general survey of the premises is obtained. Drive ways through the shops are plentifully provided, and weighing scales are so placed as to accommodate incoming and outgoing materials, and for the weighing of rough castings in transit from the foundry to the finishing shop. The core oven, 14x20 feet, is placed near the cupolas, together with a house for core making. On the other side of the cupolas is a small house for brushing and cleaning castings. It will be advisable in localities

patterns will be required; this will be built on a portion of the space of the side yard, and will be disconnected from the other buildings.

An iron works planned as shown and described would, for its purpose, be superior to any existing at the present time, and its capacity, in proportion to its cost, be far ahead of any. The iron business is a heavy business, and to manufacture in a first-class way requires a large capital. Whatever amount of money is put into the venture—and it is a venture, as all business operations are—be it remembered that this capital is worth 7 per cent. per annum, for that interest can be obtained without risk and without trouble. Then there are expenses connected which are inevitable and constant, whether much or little is done. Taxes, insurance, office employees, expenses of running engine, pay to foremen, etc.; these go on about the same whether 100 or 300 men are employed as producers—the same on \$100,000 as on \$300,000 worth of work. Above a certain limit on a given investment, the difference between the cost of the raw materials and labor employed, and the prices obtained for the finished articles, is the profit. Therefore, one of the secrets of making money is to keep the works filled to their utmost capacity.

To illustrate this principle, suppose that a

suits may confidently be looked for at the end of the fiscal year. If a job be taken at an unprofitable figure, no amount of drive can overcome the error, whether intentional or unintentional, made at the start. But whether a job is taken at a good price or a poor one, never slight the work. Always do the best that can be done, both in material and in execution. A reputation for good castings and true fitting will in due time become extensively known, and turn the scales of owner's preference in giving such an establishment work where estimates run close. The expense of doing good work is no greater, and perhaps not as great, as to do botch work. If the workmen are held up to a proper standard, and whenever a mechanic shows himself incompetent or careless, he be discharged and replaced with a better man, the entire force will do their work in a thorough and expeditious manner. If any journeyman be addicted to drink, no matter how good a mechanic he may be, or if he is disputative or loud in his political preferences or religious views, it is well to weed out all such and be free of them.

The cost of ground and buildings has been set down as \$55,000. The machinery will require an expenditure of \$45,000, and a working capital, over and above all, of \$50,000. Thus the

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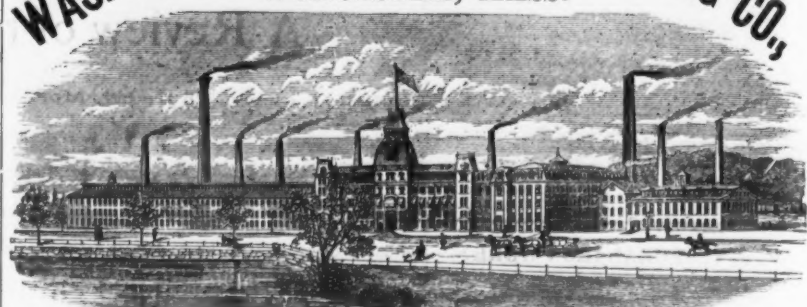
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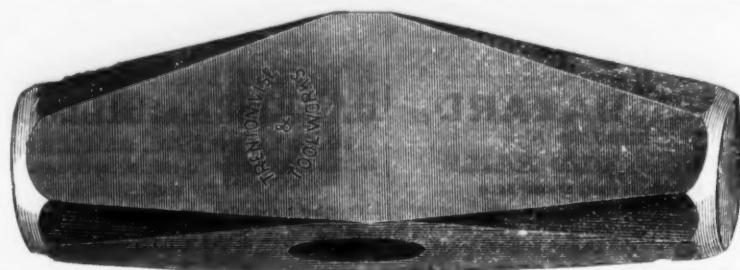
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If you make all of your Tea Kettles with the CHICAGO TRIMMINGS, you will materially increase your trade.

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This Compound is manufactured under the inventor's personal supervision, and is put up and warranted genuine only in 1, 5, 10, 50 and 100 lb. packages, and under the above trade mark. The 1, 5 and 10 lb. packages are kept for sale by the following, among other houses, who will also procure, on order, the larger ones:

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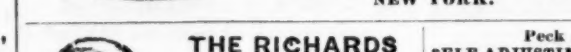
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I sell my Carriage Ornaments to dealers only.

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**SELF-ADJUSTING AMERICAN CLUB SKATE**

After the severest tests for the past three years, these

skates are now admitted to be the only practical Self-

adjusting Skates in Market. The clamps are

first adjusted to the shoe by turning the thumb-screw D

when the lever C is in the above position; when once

adjusted, place the skate on the foot, close the lever C,

and the skate is securely fastened to the foot. By the

action of the clamps, the skate is always in the center of

the foot, and cannot slide from side to side as in other

club skates. They require no heel plates, key or wrench.

PRICE LIST. Per Pair.

No. 1.—With Blued Footplate, and Runners the

same as the best..... \$5 00

No. 2.—Same as No. 1, only nicely Nickel Plated,

effectually prevents the skate from rusting..... 6 00

No. 3.—Same as No. 2, only before the skate is put

together, each part is finely polished and heavily

Nickel Plated, the finest skate ever offered..... 6 00

A special discount to the Hardware Trade. Address

**PECK & SNYDER, Manufacturers,**  
No. 101 NASSAU STREET, N. Y.

## London Water Supply.

The following is an illustration of the man-  
ner in which the great water companies of Lon-  
don treat the consumers. In this country we  
sometimes hear complaints against our water  
supply, but such troubles as those narrated do  
not occur in this country, where the water supply  
is usually undertaken at public expense.

We quote from a London paper as follows:

The public, in their individual and house-  
holding, as distinguished from their sharehold-  
ing, capacity, have acquired a not unnatural  
habit of regarding companies as natural ene-  
mies, against whom an individual citizen con-  
tends at fearful odds. Railway, gas and water  
companies, and in a still more remarkable de-  
gree, amalgamations of companies, have grown,  
in homely phrase, "out of knowledge." They  
are difficult to approach. They are callous to  
appeal. They are deaf to reproof. He who

enters the lists against them knows that he has  
a long, a weary and a costly fight before him,  
and unless he has a formidable balance at his  
bankers, is well advised to avoid the struggle.

It is now pretty well known that the trumpery  
bye-laws and conditions printed on railway tick-  
ets and like documents will not override the  
common law of the country, but, for all that,  
great companies possess a power of irritating  
and oppressing a customer which places the  
latter at an immeasurable disadvantage. He

may be delivered by train hours too late to keep  
an important appointment, his gas may burn  
dimly, his supply of water may be unsatisfac-  
tory, but he must be a bold man who seeks  
redress. Such a man occasionally turns up.

A short time since, Mr. James Grimes, of 8 Osborn street, Whitechapel, tak-  
ing courage from despair, summoned the East  
London Water Works Company to Worship  
street, to answer his complaint that they had  
failed to supply water to his premises in con-  
sequence of certain disputes pending between  
him and the company aforesaid. The com-  
plainant might have sued for a fine of £200 for  
the first month, and £100 for the second month,

but, declining this part of the question, he  
simply wished for the vindication of what may  
be called his aquarian rights as a citizen. Up  
to the 13th of August last the house built by  
Mr. Grimes had been duly supplied with water,  
and no complaint had been made by the com-  
pany, although his fittings for water supply had  
been inspected every year by the company's  
officers, but on the 1st of July the company  
gave notice of regulations made by them as to  
fittings "ordered by them" with a view to pre-  
venting waste in the water supply, and "re-  
quired" all proprietors of houses on which the  
notice was served to supply those fittings.

These were found to be a stopcock with brass  
ferule equal to a half-inch pipe. They had also  
made it obligatory to employ the company's  
workmen to make the necessary openings in  
the ground, and to pay the company's charges.

Furthermore, they imposed a penalty of £5 for  
default, made the occupier or owner liable to  
have the water cut off, and lastly, to be pro-  
ceeded against for a nuisance. Mr. Grimes  
supplied the screw ferule on the 12th of Aug-  
ust, and although the company's inspector  
had previously been over the premises and,  
it is stated, agreed to leave over some  
minor points of discussion as to a waste pre-  
venter, &c., the company's workpeople entered  
his house on that day, and after some discus-  
sion with his servants, summarily cut the water  
off. For twenty-eight days the complainant in  
the case was left without water, and it was not  
until he appeared before the magistrate, and  
that at the magistrate's suggestion the company  
was written to, that the water was put on

"without prejudice." During these twenty-  
eight days he was kept without water and was  
liable to be prosecuted by the sanitary authori-  
ties, who "were unable to help him to obtain a  
new supply." It is also stated that the fittings  
required by the company—in rearranging pipes,  
&c., would have cost about £14—"to be paid to  
the company."

Now, without going into the merits of Mr.  
Grimes' case, we may, "without prejudice,"  
call attention to this most monstrous abuse of  
self-arrogated authority. The companies to  
which we are signed, sealed and handed over,  
appear to imagine that they may "at any time,  
or from time to time," impose new regulations  
subjecting their customers to considerable ex-  
pense, and may impose fines, cut off supply  
and proceed against recalcitrant citizens as  
nuisances. This is a little too much. Instead  
of discussing a disputed case, the East London  
Company, or its representatives, assume the  
functions of plaintiff, judge and jury, and not  
only refuse to hear reason but proceed at once  
to pass sentence and levy execution. Jedburgh  
justice was, perhaps, a good thing in its day,  
but at the present time is apt to suggest that  
London, like other great cities, should take its  
sanitary work into its own hands.

**Zinc as a Preventive of Boiler In-**  
**crustation.**—Among the various means used  
of late for preventing scale in boilers is zinc  
introduced into the water space in ingots from  
one to two inches in diameter and about 14  
inches in length. We have made frequent use  
of it, and in many instances it has worked well,  
though we think its effects are different in dif-  
ferent waters. An ingot of zinc of the size in-  
dicated above will disappear in from three to  
four months. We have made trial in nearly all  
the New England States and in some of the  
Western States, and we believe that in most  
cases it has shown good results. From what  
we have seen we are inclined to the belief that  
the iron of the boiler and the zinc form a vol-  
taic couple, and that the water is sufficiently  
acid to excite galvanic action. The zinc is con-  
sumed, leaving an oxide well known to those  
who are familiar with the sulphate of copper  
battery, while the iron acts the part of an elec-  
trical conductor. The scale is rendered soft,  
porous and friable, and is easily removed from

the boiler. We would not be understood as  
saying that this is true in all cases. We are of  
the opinion, that the quality of the water has  
much to do with the success of this method.  
Mr. J. F. Donoghue, of Springfield, Mass., has  
devised and patented an anti-incrustator made  
by casting an ingot of zinc around a coil of  
copper wire. The ingot is flat on one side, and  
the coil is, consequently, only about two-thirds  
imbedded, leaving one-third to be acted upon  
by the water. Whether the introduction of a  
third metal, viz., copper, is an advantage, we  
are unable to say. But so far as we know, Mr.  
Donoghue's invention has worked well in most  
instances. We shall watch this method of  
treating scale, and report from time to time  
what our experience is.—*The Locomotive.*

## A Great Oil Refinery.

The Standard Oil Works, at Cleveland, Ohio,  
are said to be the largest of the kind in the  
world. They cover an area of one hundred  
acres of ground, twenty acres of which are  
piled full of barrel material. The stock of this  
description of material on hand on the first of  
last January was inventoried at \$800,000. From  
2300 to 2400 men are employed in the works  
when running to their full capacity, and from  
10,000 to 12,000 barrels of refined oil is the daily  
product. Four thousand five hundred carboys  
of sulphuric acid and 4,500,000 gallons of water  
are required daily in the refining process.

Among the stills used there is one, the largest,  
with a capacity for 2200 barrels, another for  
1500 barrels, and a number of others with  
smaller capacities. It requires from two to  
three days to draw off the contents of the larger.

The agitator is an immense open tank, with  
a capacity for over 2000 barrels. The acid used  
is stored and used over a number of times.

The refuse from the refinery undergoes  
another process of refining in the works of the  
Merian Morcan Paraffine Co., on the grounds,  
and is shipped as paraffine to New Bedford,  
Conn., where it is made into candles. About  
three tons of this material is produced daily.

The slag of the refinery is burned as a fuel, and  
is fully as good as the best coals for heating  
purposes, and leaves scarcely any ashes.

The cooperage connected with and a part of  
these works is the largest in the country. The  
entire process of reducing the lumber to  
finish barrels is carried on in the establish-  
ment. About six days are required to reduce  
the timber, in its rough state, to a merchantable  
barrel, involving the cutting, sawing, season-  
ing, shaping and forming into a barrel, hoop-  
ing, gluing, painting and making the same.

A greater part of the work is done by ma-  
chinery, run by two engines, one of four hun-  
dred and eighty and the other of two hundred  
horse-power. The barrels receive a coating of  
glue in the interior to render them impervious  
to the oil. The glue used for this purpose is  
manufactured in the works. Five thousand  
pounds of glue are made daily. One thousand  
barrels per hour is the average capacity of the  
works when fully employed.

The works, including the refinery and cooper-  
age, are at present running to about one-half  
their capacity.

## The Attempt to Run From N. Y. to Pitts-

burgh in Ten Hours.

Last week we noted the fact that the Penn-  
sylvania R. R. had just completed a monster  
engine intended for this work. We take from  
the Pittsburgh Commercial the following ac-  
count of the first trip:

The train left the depot in Jersey City at 7  
o'clock on the morning of the 9th. It con-  
sisted of two passenger coaches and one bag-  
gage car, drawn by the monster engine No. 573.  
The baggage car was divided into two com-  
partments—one for coal and the other for  
water. The coal was filled in sacks and the  
water in hogsheads. About 150 bushels of coal  
was provided for the trip from New York to  
Pittsburgh. Only about four hogsheads of  
water were taken on board, as the most of the  
water supply was obtained from the troughs  
along the route without stopping. The party  
consisted of General Manager Frank Thomson  
and other officials, the party numbering about  
100. The crews designated to run the train on  
the different divisions were sent to New York  
a day or two before its departure, it being the  
intention to make the run without making a  
stop. The distance from New York to Pitts-  
burgh being 444 miles, the average speed re-  
quired would be about 44 miles an hour.

The train reached Philadelphia at 6:15 a. m.,  
the time prescribed by the special schedule.  
At 10:25 a. m., it had reached Pomeroy, a  
station between Coatesville and Parkersburg,  
about 44 miles west of Philadelphia. At this  
point an accident occurred which caused an  
abandonment of the project. C. S. Douglass, as-  
sistant road foreman of engineers, while leaning  
from the platform of one of the coaches, was  
struck on the head by a projecting roof of a  
milk depot and instantly killed. The train  
stopped and took the dead body on board,  
bringing it on to Harrisburg, losing 23 minutes.

At the last named city another stop was made  
for the purpose of leaving the body of the un-  
fortunate Douglass, and the train being now  
more than half an hour behind time, it was  
found necessary to abandon the original pro-  
gramme.

No further attempt being made to comply  
with the schedule, the train was an hour and a  
half behind time when it arrived at the Union  
depot. Notwithstanding the lateness of the  
hour of arrival, a large and excited crowd was  
in waiting, and the railroad officials who came  
on the train were surrounded and subjected to  
divers interviews touching their experiences  
en route from the metropolis.

A representative of the Commercial ques-  
tioned a number of the leading officials of the  
road as to their prospect of carrying out the  
ten hour programme. They all express them-  
selves as confident of their ability to make the  
time, and say that another attempt will be made  
as soon as the annual road inspection, which  
will be commenced to-day, is completed. The  
next trial will probably be made about the 23d  
inst.

## EDWARD SWEENEY, Brass Founder,

**GONG BELL**

Manufacturer, Machinist, Blacksmith, Locksmith,  
and Bell Hanger. 4 DUANE STREET,  
Bet. Rose and William St., NEW YORK.



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<b>NEW YORK.</b> <b>OGDEN &amp; WALLACE,</b> Successors to GAM'L G. SMITH & CO., <b>IRON WAREHOUSE,</b> 85, 87, 89 and 91 Elm Street, New York. (One block below Canal Street.) <b>COMMON AND REFINED IRON</b> <b>SHEET AND PLATE IRON,</b> Rod, Hoop, Band, Scroll, Horse Shoe, <b>Angle and T Iron.</b> Wrought Iron Beams. Iron of all sizes and shapes made to order. <b>Manchester Steel Works,</b> <b>ENGLAND,</b> sell from stock, at lowest prices, all descriptions <b>Best Tool &amp; Machinery Cast Steels</b> <b>SPRING STEEL</b> Cast Spring, Sleigh Shoe, Toe Calk and Plow Steel. Best Cast Steel and Bessemer Wire Rods. AGENTS: <b>PIERSON &amp; CO.,</b> 24 & 26 Broadway, and 77 & 79 New St., NEW YORK CITY. <b>JACKSON &amp; CHACE,</b> 208 & 208 Franklin St., N. Y. Importers and Dealers in <b>IRON and STEEL.</b> Agents for <b>JOHN A. 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Price only \$7.50 per square, painted on both sides, packed ready for shipping. <b>BORDEN &amp; LOVELL,</b> <b>Commission Merchants</b> 70 & 71 West St., <b>New York.</b> Agents for the sale of <b>Fall River Iron Co.'s Nails,</b> <b>Bands, Hoops &amp; Rods,</b> AND <b>Borden Mining Company's</b> <b>Cumberland Coals.</b> <b>WILLIAM H. WALLACE &amp; CO.,</b> <b>IRON MERCHANTS</b> Cor. Albany & Washington Sts., <b>NEW YORK CITY.</b> <b>Wm. H. WALLACE.</b> <b>Wm. Bispham</b>	<b>NEW YORK.</b> <b>C. HUERSTEL,</b> <b>IRON AND STEEL.</b> Warehouse, 99 Market Slip, N. Y. <b>IRON AND STEEL OF ALL KINDS</b> Constantly on hand. Horse Shoe Iron and Nails, Nor- way Iron, Cast Spring, Toe Calk, and Bessemer Steel Tire. Also, SPRINGS, AXLES AND BOLTS, For Truck and Carriage Makers. <b>WM. GARDNER'S SONS.</b> Successors to WM. GARDNER, 875 Grand, 414 Madison & 309 Monroe Sts. <b>Bar, Hoop, Rod, Band and</b> <b>A. W. 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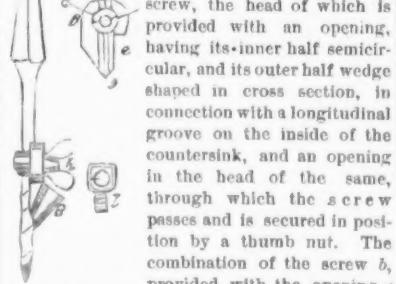
DIRECTORS: Geo. W. Woodward, J. H. Catherwood, D. A. Dangier, Henry Pemberton, Henry P. Sloan, F. C. Hollis, J. T. Audenried.

## New Patents.

We take the following abstract of new  
patents, recently issued, from the official  
record:

## COUNTERSINK.

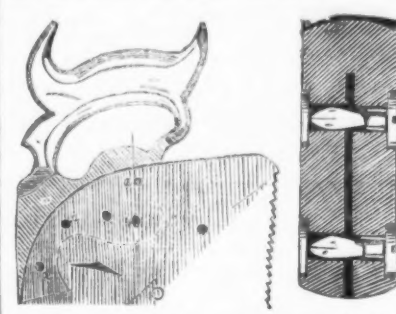
To Theo. P. Farmer, Boston, Mass.—The coun-  
tersink can be readily applied to bits of differ-  
ent diameters by means of a



screw, the head of which is  
provided with an opening,  
having its inner half semicir-  
cular, and its outer half wedge  
shaped in cross section, in  
connection with a longitudinal  
groove on the inside of the  
countersink, and an opening  
in the head of the same,  
through which the screw  
passes and is secured in po-  
sition by a thumb nut. The  
combination of the screw b,  
provided with the opening c  
and nut h, with the countersink B, provided  
with the groove e and the opening a.

## HANDSAW.

To Henry Dinton, Philadelphia, Pa.—The  
handle is forced against the butt of the blade,  
and caused to gripe the blade, by providing the  
back of the blade with a small shoulder, against  
which the upper forward part of the handle  
fits, and forming the butt in the arc of a circle,



and securing it in a slot corresponding thereto  
in the handle by transverse bolts of tapering  
form. The saw blade A, its curved butt and  
shoulder z, and the handle B, adapted to the  
blade and shoulder, in combination with the  
transverse bolts, whereby the handle is caused  
to gripe the blade, and is forced against the butt.

## Spongy Iron.

Mr. Gibbs, in a paper lately read before the  
Chemical Society of Newcastle-upon-Tyne, said:  
"Spongy iron," or "iron sponge"—the  
slightly cohering mass resulting when iron  
ores are reduced below the welding heat of iron  
—is produced in nearly all iron smelting pro-  
cesses, although it is a form of iron but little  
known in practice. Many proposals have been  
made to separate iron smelting into the two dis-  
tinct operations of reduction to sponge and the  
subsequent welding or melting of this product  
to produce malleable iron, steel or cast iron.

The earliest attempts on a large scale where  
those of Clay, under patents obtained in 1837  
and 1840, and he has been followed by a series  
of inventors of whom Chénot conducted the most  
elaborate recorded experiments. Efforts in this  
direction still continue, two processes, having  
for their object, respectively, the manufacture  
of puddled bar and steel, being now carried on  
on a somewhat large experimental scale; and  
lately a series of extensive experiments were  
made by Siemens, with specially planned fur-  
naces, that certainly reduced the ore to sponge  
and smelted the latter successfully, so far as  
economy of working was concerned. But iron  
as sponge is in a most favorable condition for  
absorbing sulphur from the reducing agent and  
from furnace gases—a drawback that com-  
pelled Siemens to abandon this method of  
working.

Although the separate production of spongy  
iron, for the manufacture of iron, does not give  
workable promise, the fine state of division of  
the metal in the iron sponge renders it very  
suitable for the precipitation of copper from  
solutions produced in the extraction of copper  
from its ores by the wet method.

For the use of spongy iron, in the reduction  
of sulphides, &c., in the dry way, Brox and  
Deherryon obtained a patent in 1859, and later  
in the same year Gossage patented the use of  
spongy iron, reduced from burnt pyrites in  
ovens and muffle furnaces, for the precipitation  
of copper from solution. In 1862 Bischof pat-  
ented the manufacture and application of  
spongy iron for copper precipitation, his pro-  
cess and raw material being essentially the same  
as those described in Gossage's patent three  
years earlier. In 1863 Bischof patented an ar-  
rangement of reverberatory furnace and acces-  
sory apparatus, for the production of spongy  
iron for use in precipitation and other pur-  
poses. Henderson, in 1863 and 1867, patented  
a variety of furnaces, and in 1869, Snelus  
patented a furnace similar to Gerstenhofers'  
pyrites kiln, for the production of spongy iron,  
but no one of their devices has been adopted.

Proposals patented later than Bischof's have  
had for main object the production of sponge  
for the manufacture of iron and steel. Most of  
these have been some form of retort or muffle  
furnace in which the mixture is heated by  
transmission through brickwork, the retorts  
being horizontal or vertical. This method is  
slow in action, and the wear and tear of the  
brickwork has proved too great in practice.

Snelus' furnace, in which the finely ground ma-  
terial falls from one series of bars to another in  
a reducing atmosphere, whilst maintained at a  
red heat, appears well adapted for the produc-  
tion of sponge, but its introduction being pro-  
posed for the manufacture of steel, the liability  
of iron in this state to absorb sulphur from  
furnace gases would probably prevent its adop-  
tion.

Siemens cylindrical revolving furnace, al-  
though well adapted for quick and economical

reduction, was abandoned for this reason. The  
vertical retort furnace has been again proposed  
by Blair, who states that he has overcome the  
former difficulties of working this class of fur-  
nace. In a vertical retort externally heated,  
unless the width be impracticably small, an ex-  
cessive time is required for heating the mass  
through. Blair employs a shaft about 4 ft. in  
diameter, and by the device of a cylinder, sus-  
pended in the throat and leaving an annular  
space only 3 in. or 4 in. wide and heated in-  
ternally by gas at the same time that the ex-  
ternal shaft is kept heated, the ore enters the  
body of the furnace at a red heat, which is then  
readily maintainable in the mass. The re-  
duced iron, passing down into a cooling shaft,  
is withdrawn from time to time whilst fresh  
ore and charcoal are charged into the annular  
mouth.

Only one form of furnace is now employed in  
making iron for precipitation. This is essen-  
tially a reverberatory furnace 30 ft. long, with  
provision for conveying the flame under the  
hearth, after it has passed over the charge.

The hearth of the furnace is 23 ft. long and  
8 ft. wide, and is divided into three working  
beds by bridges. Each bed has two working  
doors on one side. The doors slide in grooves  
and close air tight. The fire is 4 ft. by 3 ft.,  
with bars 4 ft. 8 in. below the bridge, thus al-  
lowing for a considerable depth of burning  
fuel. The fire door slides in grooves like the  
working doors. The hearth is formed of tiles  
sustained on brick work partitions forming  
flues through which the flame returns after pass-  
ing over the hearth. From these flues the flame  
drops, by a vertical flue alongside the fire  
bridge, to an underground flue communicating  
with a chimney. The entrance to the latter flue  
is provided with a fire tile damper, which is  
closed whenever the working or fire doors of  
the furnace have to be opened. A cast iron  
pan, 20 ft. by 10 ft., is carried by short columns  
and girders over the furnace roof. In this pan  
the ore is dried and mixed with coal, and from  
it is charged into the hearth through cast iron  
pipes, built into the furnace arch. The furnace  
is elevated on brick pillars, to allow of iron  
cases running under it, to receive the reduced  
iron, and it is worked from a platform of cast  
iron plates. A vertical pipe, 6 in. diameter,  
passes through the hearth of the furnace, inside  
each working door, and through these pipes  
the reduced iron is discharged into iron cases  
placed beneath. These cases are horizontally  
rectangular and taper upward on all sides.  
The cover is fixed, and in its center is a hole  
6 in. diameter, with a flange upward, which  
serves to connect the case with the discharging  
pipe. The bottom of the case is closed by a  
folding door, hinged on one side, and secured  
by bolts and cutters on the other. The case is  
fitted with four wheels, clear of the door, and  
is covered with a cast iron plate, fitting loosely  
into the opening on the upper side. It stands  
4 ft. 8 in. high, and has a capacity of 12 cubic  
feet.

The furnace hearth being at a bright red heat,  
each of the three working beds is charged with  
20 cwt. dry purple ore and 6 cwt. ground coal,  
from the cast iron pan over the roof. The fire  
and working doors are closed, and the only air  
entering is that through the fire, in working  
which care is taken to prevent the mass of burn-  
ing fuel getting hollow. The charge in the first  
bed from the fire bridge is reduced in from 9 to  
12 hours; in the second, in 18 hours; and in  
the third, in about 24 hours. Each charge is  
stirred over two or three times during the  
period of reduction. Before opening any door  
the flue damper is closed to prevent a current  
of air entering over the charge. On the com-  
plete reduction of the charge on any working  
bed, two cases are run under the bottom pipe,  
to which their mouths are luted by clay, and  
the charge is quickly drawn into them by rakes  
worked through the doors. The cases are then  
removed and closed with cast iron plates. In  
about 48 hours the iron is cooled sufficiently to  
be discharged, and this is simply done by rais-  
ing the case by a crane, and knocking out the  
cutters fastening the hinged door on the bot-  
tom, when from the tapering form of the case  
the mass of reduced iron falls out readily. The  
sponge is ground to powder under a pair of  
heavy edge stones 6 ft. in diameter, and is  
passed through a sieve of 50 holes per lineal  
inch.

For the manufacture of spongy iron for pre-  
cipitation, two materials have been proposed,  
viz., burnt pyrites and "purple ore." The fol-  
lowing are analyses of these materials:

	Burnt ore.	Purple ore.
Ferric oxide.....	78.15	95.10
Iron.....	3.76	—
Copper.....	1.55	—
Sulphur.....	3.62	—
Cupric oxide.....	2.70	—
Zinc oxide.....	47	—
Lead oxide.....	84	—
Calcium oxide.....	38	—
Sodium oxide.....	13	—
Sulphuric acid.....	5.90	—
Arsenic acid.....	25	—
Siliceous residue.....	1.85	2.13
Total.....	99.27	99.25

Bischof and Gossage both proposed the use of  
burnt ore on the ground of the obvious economi-  
cal advantage that the copper it contains is ob-  
tained, with the precipitated copper, without  
the expense of extraction. But burnt ore con-  
tains a notable proportion of arsenic—16 per  
cent. in above analysis—and this metal, remain-  
ing in the sponge, is left mixed with the pre-  
cipitated copper, and seriously deteriorates the  
quality of the refined copper ultimately made  
from it. Bischof states that "should the ore  
have contained traces of metals, such as arsenic  
or lead, they will be volatilized during the pro-  
cess of reduction." Whilst lead is reduced and,  
in a great measure, volatilized in the  
spongy iron furnace, the arsenic in such ore  
being present mainly as arseniates of copper  
and iron, which are likely to be reduced to  
fixed arsenes, is not volatilized, spongy iron  
made from burnt ores containing a proportion  
of arsenic closely agreeing with that in the ore.  
"Purple ore," which retains only the most

minute trace of arsenic, is the only material  
now employed, and the following analysis gives  
the composition of spongy iron made from pur-  
ple ore by means of the furnace and method  
described above: Ferric oxide, 8.15; ferrous  
oxide, 2.40; metallic iron, 70.40; copper, 24;  
lead, 27; carbon, 7.60; sulphur, 1.07; alumina,  
19; zinc, 30; siliceous residue, 9.00; total,  
99.62. In using spongy iron in precipitating  
copper, the liquors are agitated by an air blast  
whilst the iron is gradually added. By this  
means a very perfect mixture is obtained, and  
a copper precipitate can be readily produced  
containing not more than 1 per cent. of metal-  
lic iron. As compared with precipitation by  
scrap iron, the economy of space required and  
facility of manipulation are very great. On the  
side of spongy iron precipitation are cheapness  
of material and economy of application; whilst  
against it is the presence with the precipitated  
copper of the unreduced iron oxides and excess  
of carbon from the reduction. In employing  
spongy iron, the copper extractor has the pro-  
duction of the precipitant in his own hands,  
and avoids the troublesome handling of a ma-  
terial so cumbersome as scrap iron.

As regards the chemistry of spongy iron pre-  
cipitation, it is, of course, identical with that of  
scrap iron precipitation, and although it is  
stated by Bischof that, "Some substances, such  
as arsenic especially, are only precipitated after  
the iron has been in contact with the solutions  
containing copper and these substances for sev-  
eral hours. The precipitation of the copper by  
any process being finished in a much shorter  
time, and the solutions then being separated  
from the iron powder, the above substances  
cannot be precipitated or mixed with the pre-  
cipitated copper," the writer has been unable, with  
iron in any form, or with copper solutions in  
any state, to completely precipitate copper and  
leave any, even the smallest, proportion of ar-  
senic in solution.

## English and French Railways.

The *Railway World* says: M. de Franque-  
ville, in a report on English railways, gives a  
very characteristic and amusing sketch of how  
the failures of railroads in England and France  
to perform their duty to the public are received  
by the people of those countries—the French  
railroads being under almost absolute govern-  
mental control, and the English being largely  
independent. In France there is but little  
rivalry possible, and this prevents progress,  
every movement of trains and all prices for  
freight and passage being determined by the  
railway bureau. In England all train service  
and tariffs are free to the companies, within  
range of their charters, so rivalry has been car-  
ried to an extreme, and the necessities of the  
road have done much to produce improvements  
on the road, the machines, and in the manage-  
ment, which has reduced the cost of transporta-  
tion. The Englishman, looking upon the  
railway as a public servant, is always ready to  
demand the service agreed upon. He holds  
that the grant of a charter by Parliament is a  
contract in which there is a "quid pro quo,"  
and fairly judges that if the company want the  
"quo," he wants the "quid." So, on any dereliction  
of duty, or failure to perform proper  
service—if a train is an hour behind time, if a  
ticket office is opened a few minutes late, or he  
has lost his valise—the Englishman rushes into  
the *Times* with his complaint. It would be an  
advantage to our railways if the public, taking  
notice of the defects of management, would  
use the press. The English people are notori-  
ously exacting toward subordinates, and are  
always ready to maintain their rights. We  
need not follow them in their exactions, but  
might, with good results, in their determina-  
tion to maintain their rights. Travelers are  
not disposed to address the railway officials  
with their complaints, knowing their fate is too  
often in the waste basket; but they will notice  
a complaint in the press, for this is read by the  
officials, both high and low, and it is much  
more efficacious in correcting wrong.

But in France it is entirely different. There  
are no public complaints, and M. de Franque-  
ville suggests some very conclusive reasons for  
it. Among them—1. The traveler would not  
complain. 2. The newspapers would not print  
his complaints. 3. The public would laugh at  
him.

This is the result of the difference between  
free and bureaucratic government.

The *Commercial Bulletin* has the following  
sensible remarks upon the evils growing out of  
the habit of giving elevators to the charge of  
boys: "The growing custom of entrusting  
the running of elevators in our public and busi-  
ness buildings to heedless boys is one that  
should be checked, before attention is called to  
it by some disastrous accident. Although it  
calls for no special intelligence, the position is  
such that only trustworthy men should have  
charge these machines. The natural energy of  
any lad finds the field too limited for its proper  
action as "conductor" on an elevator, and  
visits from other boys are encouraged, his at-  
tention distracted, and the business man using  
an elevator finds his attention arrested by  
lively disputes about the merits of the last time  
novel or base ball match. This causes a lack  
of attention, and when halted for egress or in-  
gress, the passenger is likely to find, by a  
stumble, that the elevator is either several  
inches too high or too low. Another evil is  
that, as soon as the novelty of riding up and  
down is worn off, the occupation becomes irks-  
some, and the lad seeks new fields for his labor.  
So on the ground of economy this system has  
no merit, considering the risk run, and the  
annoyance to those who desire to avail them-  
selves of this modern improvement.

The keel of an immense double turreted  
monitor is being laid at Roach's ship yard,  
Chester. The vessel, when completed, will  
be a monster, and will no doubt be a valuable  
addition to the United States navy.



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rence..... 1 50  
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termine, the charge must necessarily depend  
upon circumstances.  
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rence..... 4 00  
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soluble Silicious Matter in a Limestone..... 10 00  
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ible Matter, fixed Carbon, and Ash in Coal..... 12 50  
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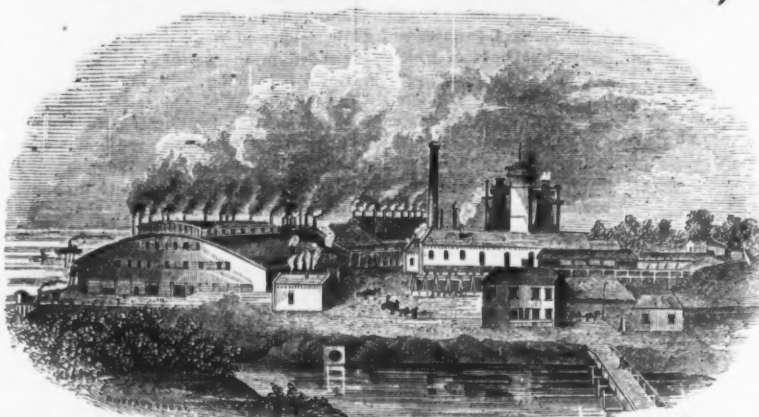
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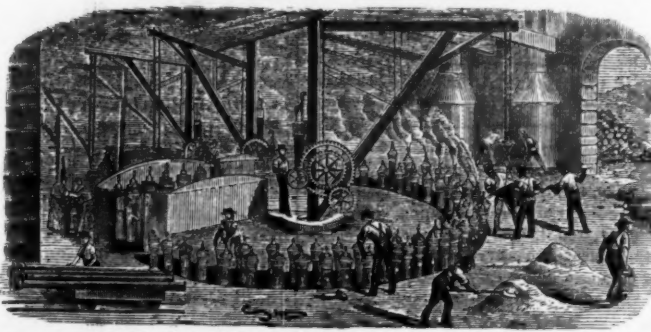
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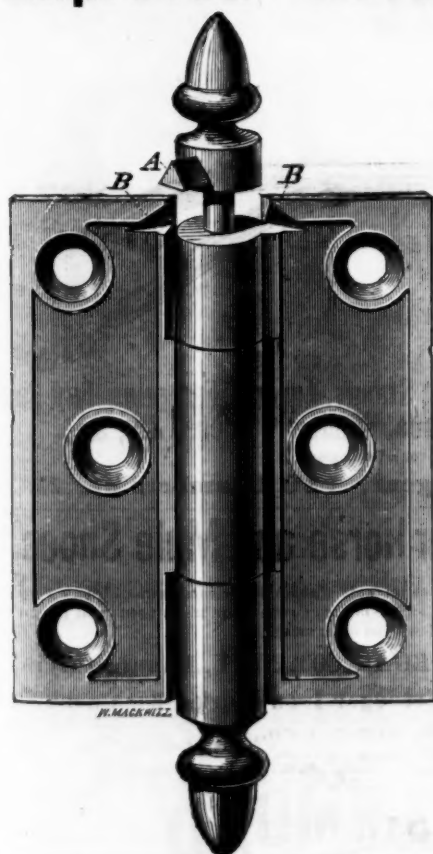
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**Blast Furnace Hearths.\***

BY MR. CHARLES WOOD, Tees Iron Works, Middlesbrough.

(Concluded.)

One of the most important inventions, and, perhaps, one of the most practical, was taken out in September, 1867, by Mr. Karl Holste, and is known as "Lurman's" patent closed hearth system. In the furnaces Mr. Lurman had to deal with on the Continent, those possessing no fore hearth, and in which the slag was drawn off periodically, were the most common.

The slag in these furnaces was run off through a hole or slit in the well or crucible walls, put in at the most convenient place for getting rid of the slag. As furnaces, however, increased in size and production, the same style of well was still retained, but here came the difficulty. It became necessary to let the slag run continuously, and it was very soon found that this slit or hole could not be regulated, the continuous stream of slag, as before pointed out, soon cut away the brickwork, the hole becoming so large that the blast and the coke were constantly blowing out, and the blast had very frequently to be shut off, whilst fresh clay stopping was put in, and it became evident that unless this hole could be kept to its original size, the working of the furnace would be seriously interfered with. It was at this stage that Mr. Lurman introduced into the furnace his slagging block or tuyere, which at once overcame all difficulties and proved a great success. The hole ever remaining the same size, enabled the blast to be kept always on, whilst a higher pressure was thus admissible, and the make of iron greatly increased.

The success of this plan in this country has not, however, been so great as on the Continent, although I believe it has done very well in the smaller hematite furnaces, where the quantity of slag is much less in proportion to the quantity of iron produced than in the Cleveland district.

Having made up my mind to adopt this walls round the hearth, and to keep the tapping hole as near the inside of the crucible as possible (as arranged by Mr. Hill) consequently, to do away with the fore-hearth, it became necessary to adopt some new method of slagging.

Amongst other plans, I went carefully into Mr. Lurman's system; but, without wishing in any way to prejudice his plan, which, undoubtedly, for certain classes of furnaces, is well adapted, I came to the conclusion that where a large quantity of slag is produced (as in the Cleveland furnaces), and where the nature was so variable, and containing so much coke, limestone, and other refuse, Lurman's arrangement was not so suitable, and I, therefore, abandoned the idea of using it, and ultimately adopted a plan which I shall presently describe.

I may here say, however, that although I was not satisfied with the system, Mr. Thomas Whitwell (well known for his "red hot blast" brick stoves), of the Thornaby Iron Works, is now working two furnaces under Lurman's patent, and it is to this gentleman that I owe my thanks for a great amount of information, as also for one of the bronze slagging blocks used in these furnaces, and which he has kindly lent for this occasion.

The slagging arrangement consists of a kind of box plate of cast iron, well cooled by a water coil, called a "scoria plate." In this plate a hole is left in the middle, into which a small bronze tuyere or "scoria block" is inserted, and which projects into the furnace two or three inches. This block has a tapered hole about one inch and three-quarters diameter, through which the slag discharges itself out of the furnace. The slagging apparatus is never over the tapping hole, but is put at the back of the hearth, or in the most suitable place for getting away the slag—a very convenient plan, but one to which I rather object, for reasons expressed elsewhere.

The tapping hole is arranged near the bottom and close to the outside of the hearth. It is enclosed by a thick water plate intended to keep the tapping hole cool. This, in my opinion, is quite unnecessary, and, from its close proximity to the metal, is rather dangerous. The hole, if well managed, will never get hot or work forward, and there is no fear of the metal bursting out.

There are two other patents for plates for letting off the slag—one taken out by Mr. William Ferrie in 1868, the other by Mr. Green, of Brymbo, taken out in 1873; but as both these seem to be modifications of Lurman's, the advantages of which I have fully described, I need only say that they have both been intended as adaptations to the old fore hearth.

At the Tees Iron Works the walls of the well, or crucible, have been made up solid all round, and a bonnet shaped tapping hole has replaced the old fore hearth, in the same way as arranged by Mr. Alfred Hill, at the City Lane furnaces. The walls are only 2 ft. 6 inches thick around the well, in place of 5 ft., as at City Lane, the tapping hole and slag hole being, therefore, so much more accessible with the thinner walls.

Over such a large tapping-hole cavity, with the slag constantly flowing, unless protected in some way, it is quite certain that the slag would cut down through in a few hours, and not only this, but the tapping-hole would become so hot that it would be impossible to keep the metal from bursting out.

To prevent this dissolving or cutting action of the slag, and to keep the brickwork cool over the tapping-hole, I have inserted a water plate. This plate lies level with the top of the dam plate.

In consequence of the thin walls, the dam plate is brought up close under the tympan plate, and the new water plate runs, therefore, underneath the tympan plate, leaving an open space between it and the tympan of about 7 in.; the width

\*Paper read before the Iron and Steel Institute at Manchester.

of this opening being about the same as in the old fore-hearth, or about 26 in.

When the furnace is at work, this opening is filled with small coal and fire clay, and a hole is made in the center of this clay, for the slag to run out, by driving in an ordinary 1½ in. or 2 in. working bar. The action of this plate is so perfect that it entirely protects the tapping-hole cavity from the cutting action and heat from the flowing slag, while, above the plate, it completely prevents the stopping (which lies between this plate and the tympan plate) from burning away, so that the hole made for the slag to run out extends but little in size, remaining nearly the same all the day, when a small piece of clay, or a few small coals, will make up the hole again for twelve hours longer. On the other hand, if the slag should get bad or stop running, another hole can be put through this clay stopping into the furnace in a few minutes, without withdrawing the blast, and, failing this, the whole opening may be cleaned out in a quarter of an hour or twenty minutes, when bars can be put into the furnace and worked in the old way; but I may say that since the day the furnace was put in blast, this has not been once necessary, nor have I had to take the blast off from defective working, or from want of the slag coming forward; and the same water plate yet remains as perfect as when started, the water flowing through it being always remarkably cool.\* It will be noticed that, by this plan, the tympan plate remains exactly as in the old furnace, the dam plate, with the exception of its being brought closer to the well, is unaltered, whilst the fore-hearth has been filled up with brick work, in place of fireclay, and the slag, as of old, is run off over the tapping-hole. As before pointed out, Mr. Barrett, Mr. Lurman and Mr. Doobs, have adopted the plan of drawing off the slag in a different place than over the tapping-hole. I have found, however, from experience, that wherever the slag flows off, there will be the chief body of metal in the hearth. The slag, in flowing, will have carried the metal with it. Here, then, under the slag hole, appears to be the best place for the tapping-hole. When placed elsewhere, the metal will be found to "lie back" in the hearth.

With regard to the preservation of the original form of the hearths, it seems quite certain that, from the way in which the walls are burnt away after a few years' blowing, the very best classes of fire brick will not stand the heat, and that above the tuyeres the thickness will be reduced to about two feet. It is, therefore, reasonable to suppose that, if we make our walls about this thickness, the atmosphere will have sufficient cooling effect to retain them at these dimensions.

In Wales, they appear to be in advance of the Cleveland district in this respect, for, from information kindly supplied to me by our worthy president, I learn that the life of a hearth and well varies from ten to sixteen years, and sometimes going as long as eighteen years. And I also find, that Messrs. Newton, Chambers & Co., of the Thorncliffe Iron Works, near Sheffield, have lately blown out furnaces which have been 21 years in constant work. The latter had only from twelve to fifteen inches of lining on the boshes. When compared with the modern Cleveland furnaces, this seems a long time, and, by way of excuse, I would say that the Welsh and Staffordshire furnaces have not increased in size in the same way as those in Cleveland, and that our slag, being produced in very large quantities, and of a very cutting nature when in contact with brickwork, and the iron also being very hot, silicious and liquid, is very destructive to linings, the constant failure of which has led to a great increase in their thickness, under the idea that this increase would add to their durability.

In the hearth and well of No. 19 furnace, at the Dowdall Iron Works, the brickwork round the well or crucible is only 15 inches thick, being protected by strong water boshes, 3½ inches thick, with an internal water space of about 8 inches. These boshes are built into the brickwork and form part of the well. Mr. Smith, of Borrow-in-Furness, informs me that round their furnace hearths they have thick cast iron plates outside the brickwork and standing a little distance from it, and that between this plate and the unprotected brick work there is a constant stream of water flowing. These furnaces make about 450 tons of Bessemer iron per week, and a hearth lasts eight or nine years. This fact, coupled with the complete success of the water bosh arrangement at Dowdall, appears to me a complete answer to the advocates of thick walls. There seems, however, to be a great deal of prejudice against the use of water boshes or blocks round the hearth, arising chiefly, I think, from two causes, firstly, from the supposed great waste of heat, abstracted by the water, and the presumed waste of coke from this cause; and, secondly, from the liability to explosion, caused by the metal getting into the boshes out of the hearth. To the first of these objections, I would answer, that abstraction of heat in the hearth after fusion has taken place is not of much importance, so long as there is sufficient heat left to run the iron into pigs. And it is even doubtful whether this loss of heat is so great as it would be in a case where the metal is spread over a large surface, as in a burnt out hearth. To the second objection, I would reply that our president assures me that, with 20 years' experience, he has known of only two or three water bosh explosions, and those of no serious importance. Whilst at Rhymney Iron Works Mr. Laybourn kindly informs me that, with 18 years' experience they have never had an accident. That explosions do occur is undoubtedly a fact. Mr. I. Lowthian Bell told me of one at Walker, and I have heard of a few others, but I am led to the belief that, with plenty of water space and thick sides next to the furnace and with open tops, the danger is

\*One new plate has since been put in, the plate having been burnt from the water having been turned off.

not very great; whilst the economy of retaining the proper shape of the hearth must amply compensate for these disadvantages, and, speaking from my own experience, I should say that we are far more liable to explosions without water boshes than with them, for when the metal breaks out of the hearth or walls, and finds its way in water courses, culverts, or over wet cast iron plates, &c., explosions are sure to occur, with serious danger to life and limb. Then again, by the use of the water boshes, the walls can be made so thin (when attached to the old fore-hearth system) that there is the further advantage of having the dam-plate close up to the hearth, and this is so much the case at Dowdall that the difficulty with the fore-hearth is much reduced.

In a paper read before the Institute, at Liege, by M. Buttgenbach, relative to his system, he considers thin walls to be necessary all the way up to the top of the furnace; but, in my opinion, his success is solely due to the manner in which he preserves the shape of his boshes, immediately above the tuyeres. There seems to me to be no reason whatever for thin walls above the zone of fusion, where no alteration in the thickness of the brickwork ever takes place, and all the heat that is here lost by radiation is completely wasted. In the boshes and hearth, however, the loss of heat (as before pointed out) is covered by the gain obtained from the preservation of the shape, and the consequent regularity in which the furnace works.

In the construction of the hearth, floor or bottom, the employment of fire bricks should, if possible, be avoided, good stone in large blocks being far preferable; grouting the joints should never be done. The stones should be set without fire-clay, and care should always be taken to have the strata of the stone in a vertical position. The joints should be run up with fine fire-stone well sifted. This will run into the finest cracks and joints in the same way as sand runs in an hour glass. Water should always be avoided, as it only tends to split up the hearth when the furnace is put into blast. Perhaps the most perfect hearths yet known are those commonly adopted in Scotland, and which have also been used by Mr. Bagnall, of Grosmont, in the Cleveland district. This bottom is made in a similar way to concrete. Fire-stone, gauged stone or Stourbridge fire bricks are broken up small and rammed in with ganister sand, mixed with Stourbridge fire clay, containing just sufficient moisture to cause it to bind. This makes a splendid hearth bottom, upon which the brick work can be built. If this is carefully protected and dried before the furnace is put in blast, the iron will never go through it. When fire bricks are used for the well wall they should always be carefully bonded. The joints should never run radially from the inside to the out. The metal will certainly find its way through if the well is built in this manner.

The following may be taken as the advantages to be obtained by working on the closed hearth system, viz., a saving in time of about 1½ hours per day, and, consequently, an increased make of iron of about 1200 tons per annum; a saving in fire clay amounting to about 300 tons per annum; far less labor for the men, and a great economy in hammers, working bars and other tools.

I will now conclude my paper with the following remarks: That, with tuyeres equally divided round the furnace, a closed front, boshes and crucible walls protected from the heat, and with a good hearth bottom, we may hope to insure not only regularity in the quality and quantity of the iron, but also durability of the furnace, combined with economy in working. And I hope that, in laying before you these observations, I may have assisted in bringing about those very necessary "further improvements."

**Injurious Effects of Snow on Steel Rails.**—Some interesting observations under this head are communicated from an Austrian line of railway, the Kaiser Ferdinand northern line. A portion of this line, about eight English miles in length, between Floridsdorf and Wagram, is very open, and often blocked with snow in winter time. The obstacle is generally surmounted by strewing sand over the rails in front of the driving wheels to increase their bite, and putting on extra steam. This portion of the line in question has a double line of metals, formed partly of Bessemer steel rails and partly of light Martin steel rails weighing about 30-50 kilograms per running metre. Now, the skidding of the wheels frequently caused heating of the tires and rails, which are suddenly cooled again by the low temperature of the air on the falling snow. This, in itself, must be injurious to the molecular construction of the metal. But, beside, the increased friction causes a certain amount of abrasion of the upper surface of the rails at the spots where the stoppages have occurred. Examinations proved that these abraded portions varied in length from 2 to 3 English inches in length, 1-12 to ¼ inch in depth, and extended over the whole breadth of the rail. A train in passing over the depressions so caused necessarily experiences a certain shock, and it is reasonable to suppose that the concussion thereby communicated to the rail will be most felt when the ground beneath is frozen hard, so that natural elasticity of the rail has no room to play. In three instances rails so worn snapped asunder suddenly at the abraded portion, although no flaw or defect in the metal could be detected. This led to the removal of all abraded rails from this section of the line, amounting to twenty-eight lengths of Martin steel rails, and ten lengths of Bessemer rails. No similar case of fracture is known to have occurred in the iron or puddled steel rails previously in use, although the amount of abrasion they underwent must have been at least as great. The inference is that the improved rails of Bessemer and other steels, their superior strength notwithstanding, are less capable of withstanding concussion than the older rails, and consequently whenever they are used increased vigilance is requisite to prevent accidents in the winter time.—Zeitschrift.



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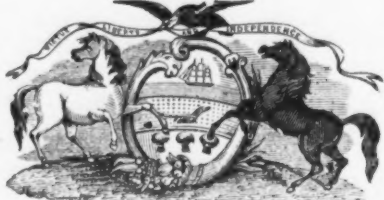
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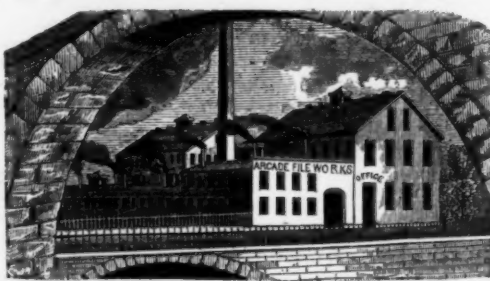
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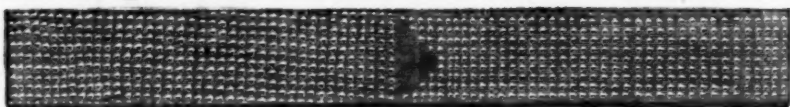
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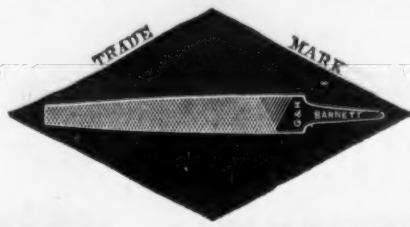
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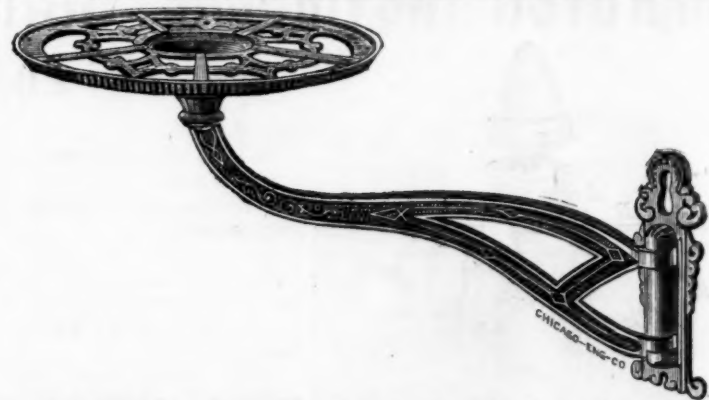
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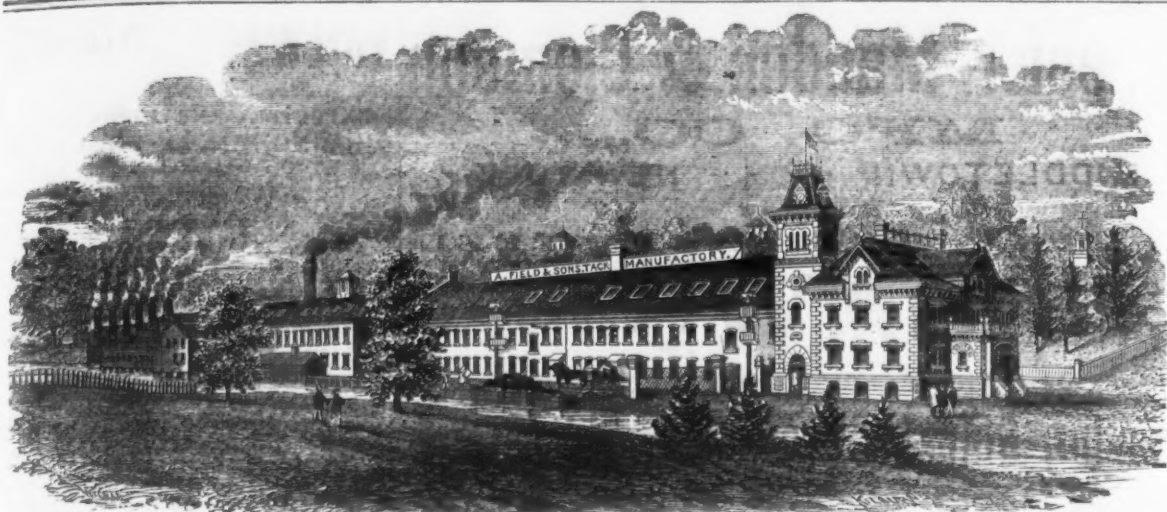
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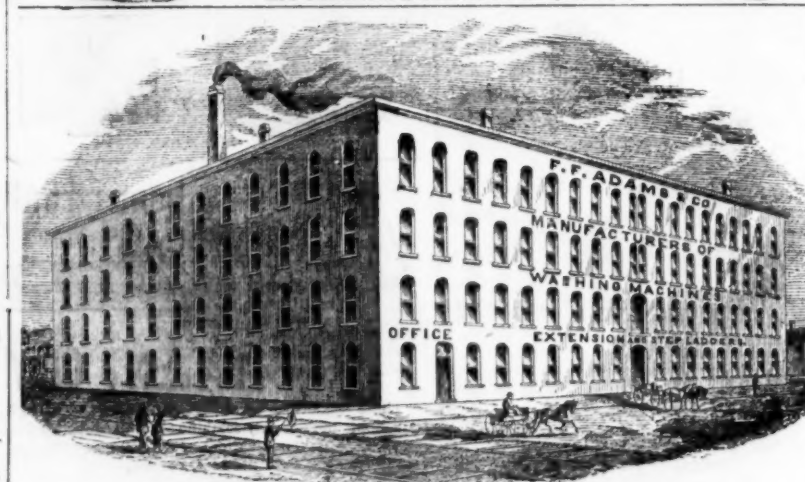
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### Price's Retort Furnace.

Mr. C. W. Siemens has written the following  
in reply to the remarks made by Mr. I. L.  
Bell, in the paper on Price's Retort Furnace,  
published in our issue of Oct. 14th:

Sir: In a paper read by Mr. Bell before the  
Iron and Steel Institute, describing Price's  
patent retort furnace, allusion is made to the  
Siemens furnace, and I shall be obliged by  
your allowing me to say a few words in reply.  
It is stated, "the preliminary conversion, how-  
ever, of the coal into a gas is attended with a  
certain amount of loss, inasmuch as the whole  
of the fixed carbon is burnt to the condition of  
carbonic oxide, which means a sacrifice of  
about 30 per cent. of its heating power." This  
would be perfectly true if solid carbon were  
employed without decomposition of water, but  
as common coal is the fuel burnt, the actual  
results are different. In the gas producer three  
operations are performed; in the lower portion  
the fuel is burnt, and this may be called the  
zone of combustion; higher up the carbonic  
acid takes up a further equivalent of carbon,  
becoming carbonic oxide; this may be called  
the zone of carbonization; whilst at the upper-  
most layer of the producer hydrocarbons are  
produced in what may be called the zone of  
distillation. The temperature of the first zone  
would be about 2400 deg. C., and that of the  
second about 960 deg. C., provided no water  
was admitted with the air for combustion. The  
mixture of carbonic oxide and nitrogen result-  
ing from this reaction, and at the temperature of  
960 deg. C., has still all the work to do, which  
is accomplished in a gas retort, namely, to de-  
prive the coal of its hydrocarbons and vaporous  
constituents, amounting to from 30 to 35 per  
cent. of the weight of fuel supplied; the work  
done in this third or uppermost zone of the gas  
producer may be valued at 300 heat units per  
pound of fuel charged,\* which would deprive  
the hot gases of 270 deg. C. of temperature,  
reducing that temperature to 690 deg. In prac-  
tice I find that the temperature of the gas pro-  
ducer chamber does not exceed 400 deg. C., the  
difference being due to further useful work per-  
formed by the heat resulting from the first op-  
eration, namely, in the decomposition of water  
introduced below the grate in a pool, into which  
the hot cinders falling generate steam, and which  
must be delivered in the proportion of at least  
0.07 lb. per pound of fuel, or 6 lb. per ton. It  
is therefore evident that the loss of heat caused  
in converting the fuel to the gaseous condition  
amounts only to 12½ per cent. of the total  
quantity in the fuel, and this even is turned to  
useful account by causing an onward pressure  
toward the furnace, in the passage of the gas  
through the cooling syphon, thus avoiding the  
necessity of an artificial blowing apparatus,  
and a closed grate, which would be sources of  
considerable inconvenience in practice.

As against this small theoretical loss must be  
set the advantages of perfect combustion in the  
furnace, into which gas and air are admitted  
through valves in proper proportions, and the  
further main advantage resulting from the ap-  
plication of the regenerators, which I need not  
here particularize.

The unfavorable estimate which Mr. Bell has  
formed of the working condition of the gas pro-  
ducer has betrayed him into under-estimating  
the practical saving realized by the adoption of  
the regenerative gas furnace. The amount of  
this saving depends in a great measure upon  
the temperature at which the work in the fur-  
nace is being accomplished, the economy in-  
creasing with the degree of that temperature.  
Thus, in melting mild steel in crucibles, an  
operation requiring intense heat, about 8 tons  
of Durham coke is required in the old process  
per ton of steel melted, which work is accom-  
plished in the regenerative gas furnace with a  
consumption not exceeding 25 cwt. of ordinary  
coal. In carrying out such operations as the  
melting of glass and the reheating and puddling  
of iron great saving has also been effected, but  
one of the largest applications of the system  
has been made to the reheating of Bessemer  
steel, requiring, as is well known, less intense  
heat than is required for the heating of glass  
and iron, and with reference to this application  
I cannot do better than quote from Mr. J. J.  
Smith's paper, read before the Iron and Steel  
Institute, on the 22d of September, 1869, in  
which he says: "The results at the Barrow  
Works, taken over a period of two years, show  
44 per cent. (saving), but the comparison is  
taken with furnaces built expressly to consume  
the hardest and best coal which could be pro-  
cured, and notwithstanding the known loss pre-  
viously mentioned in forcing the producers; but  
as the quality of the coal used was inferior,  
and very much less in price, the actual money  
saving has been more than one-half."

It would be as well to look these facts fairly  
in the face before proceeding too far in the  
prosecution of new projects involving, perhaps,  
unnecessary expenditure of time and money.

Yours, faithfully,

C. WILLIAM SIEMENS,  
12 Queen Anne's Gate, S. W.,  
October 20, 1875.

### Indianapolis as an Iron Center.

From a pamphlet on Indianapolis as a man-  
ufacturing center we take the following:

The coal field of Indiana covers nearly 7000  
square miles of the southwestern section, ca-  
pable of yielding 70,000,000,000 (seventy billion)  
tons, and is traversed by five Western railways  
diverging from the city. They strike its eastern  
limit where the beds rise close to, and even  
above, the surface, at an average distance of 50  
miles. The coal being of uniform quality, this  
abundance of means of transportation is ample  
security against oppressive freights. All qua-  
lities of coal are found in this field, from the  
\*In practice it takes 45 cwt. to distill the gas  
from 1 ton of coal.

"block"—a mineral charcoal, free from sul-  
phur and phosphorus—to the strong steam and  
gas making bituminous. Within fifteen years  
it has almost wholly supplanted wood as a fuel  
for all purposes, though much of the country  
is densely timbered, and wood is still cheap,  
comparatively. The "block" coal is the chief  
element of the city's success as a manufacturing  
point. While good for steam purposes, it is  
especially good for iron-working in all its  
stages. It requires no coking to smelt, or pud-  
dle, or roll iron. It burns like charcoal or  
wood, freely and without running together or  
agglutinating. Its blocks burn as they lie, like  
sticks of hickory. It seems made purposely for  
smelting furnaces, rolling mills and steel mak-  
ing. And there can be no better place found  
than Indianapolis for either. Two rolling mills  
have been in operation for years—one for rails  
and the other for bar and rod iron—and the  
quality of product in both is unsurpassed.  
The best rails in this country are those re-rolled  
in the rail mill; and Pittsburgh often sends to  
the bar mill for the toughest and best metal  
used in the finer manufactures. Blast furnaces  
have been much talked of, but the general de-  
pression in the iron market has delayed more  
positive effort. The "block" coal and its  
mines present several distinct, and of some  
it may be fairly said, unequalled advantages.

1. It needs no coking for any form of iron  
work, as it contains no deleterious element,  
burns without "running," can't choke a blast  
furnace, and can't damage the product in any  
way.

2. It is the best mineral fuel known for steel.

3. It is good for steam, but it is accompanied  
by other seams or admirable steam and gas  
coal.

4. It is easily mined, in many cases by "drift-  
ing" into hill sides, in others by shallow shafts;  
it is free from explosive gases; it is readily  
broken out of the seam in blocks of any desired  
size; the mines are easily drained.

5. The land on the surface is amply able to  
support by its products all, and five times as  
many, as can work below it.

6. Five railroads—one nearly completed—  
cross the field all along an arc from the south-  
west to northwest, probing every available out-  
crop and accessible seam, and assuring the  
manufacturers, by their competition, against  
unjust freight charges.

7. The field is practically inexhaustible, as  
there is block coal enough in it to make all the  
iron of the world, and supply all its fuel for a  
thousand years. To this source must be at-  
tributed the rapid development of our iron in-  
dustry. The amount of coal brought to the  
city in 1873 was 268,560 tons, costing \$1,300,000,  
against \$1,213,000 in 1872, and about \$600,000 in  
1871.

This is now the third in value of products,  
and second in number of men employed. Un-  
til 1848, or after the completion of the first  
railroad, it was, though sedulously nursed by  
some few citizens of more ardent than capital,  
a very feeble and uncertain industry. A foundry  
was established in 1832 west of the river, and  
maintained for a few years, but failed finally.  
Others followed, with little more success. But  
with the advent of railway facilities a change  
came, and some machine shops and foundries  
were started then that would not know them-  
selves in their present huge proportions. The  
coal, though known and used to some extent  
as early as 1850 or 1851, was not understood as  
it is now. Its peculiar fitness for iron work  
was still a secret. And it has come into gen-  
eral use within little more than a decade. But  
the city was the center of a great and rich ag-  
ricultural region, and needed engines and mill  
gearing, and threshing machines, and other im-  
plements, and came here for them. This was  
the first impulse. The manufacture of iron  
followed the manufacture of implements from  
iron. The development was rapid, and is in-  
creasing steadily, enlarging old establishments,  
creating new ones, and bringing her successful  
ones long established in neighboring cities.  
Now the city makes all kinds of stoves and  
hollow ware, gas posts, water and gas pipes,  
house fronts, railings, rails, jalls, bars, rods,  
engines, mill work, saws, files, edge tools, mal-  
leable iron and the like, to the amount, in 1873,  
of \$3,800,000, employing \$2,200,000 of capital  
and 1500 men, representing a population of  
6000. The city's situation, its connection with  
the "block" coal field, its railway facilities,  
and the success of its iron enterprise, attested  
by their steady growth in spite of the general  
depression, are very sufficient indications that  
it is the right place for the manufacture of  
Bessemer steel and the smelting of iron.

The great testing machine at the Washington  
navy yard has a capacity of about 300 tons, and  
has been in use 35 years. Quite recently Com-  
mander Beardslee subjected it to a stress of  
288,000 lbs., but it subsequently broke down  
under about 100 tons. The connecting bar  
which gave way had a diameter of 5 in., and  
should have originally had a strength of about  
1,000,000 lbs. Examining it after rupture, the  
fractured section was found to exhibit strata of  
varying thickness, each having a characteris-  
tic form of break. Some were quite granular in  
appearance, but the larger proportion were dis-  
tinctly crystalline. Some of these crystals are  
large and well defined. The laminae, or strata,  
preserve their characteristic peculiarities,  
whether of granulation or of crystallization,  
lying parallel to their axis and extending from  
the point of original fracture to a section about  
a foot distant, where the bar was broken a sec-  
ond time, and purposely, under a steam ham-  
mer. It thus differs from the granular struc-  
ture which distinguishes the surfaces of a frac-  
ture suddenly produced by a single shock, and  
which is so generally confounded with real  
crystallization. This remarkable specimen has  
been contributed by the Navy Department to  
the cabinet of the Stevens Institute of Tech-  
nology.



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Pawtucket, R. I.

The American File Company have the exclusive right to use the Bernot process for cutting files. By this method all the advantages of hand cutting are secured, together with an accuracy unattainable in hand work. They are the only manufacturers who employ machinery for testing files and steel.

Goods of all known manufacturers have been repeatedly tested, and interesting tables have been compiled showing the working qualities of files made by different makers, and of files made from different steels, and with various shapes and angles of tooth. They have thus reduced the manufacture of files to an exactness and perfection with a uniformity of result, as they believe, never before attained. No file, foreign or domestic, that they have ever tested, has equalled the performances of their own goods taken at random from their stock. Their machines are capable of the most delicate adjustment, and can produce the very finest work known to the trade. Special files made to order. Prominent file manufacturers are having their best goods from our works.

Price lists and information furnished on application.

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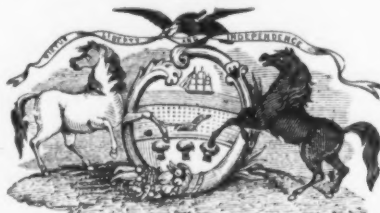
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SILVER MEDAL.

TRADE MARK.

HIGHEST PREMIUM.



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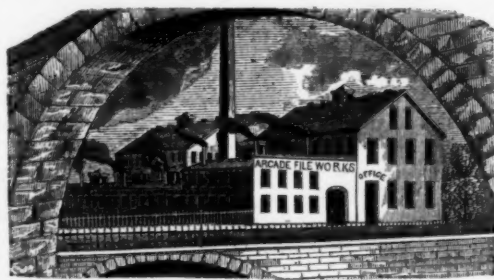
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Dealers, ARNOLD & CO., 310 California St., San Francisco. Sole Agents for the Pacific Coast.

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C. T. DRAPER & CO.  
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Manufacturers of SUPERIOR  
HAND CUT  
FILES AND RASPS



FILES AND RASPS  
Made from Best  
ENGLISH CAST STEEL.  
Quality guaranteed by written warranty  
when required.

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Established 1857.

## Madden & Cockayne File Co.

(Late WHEELER, CLEMON & CO.)

Manufacturers of the

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## FILES.

Middletown, Orange Co., NEW YORK.

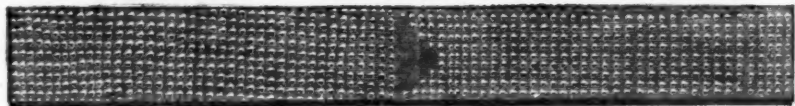
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Warranted  
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All descriptions of Files made to order. Price List mailed on application.

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Forges,  
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Wheelbarrows,  
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Jack Screws,  
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Flue Brushes,  
Waste,  
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Packing,  
Stubs' Goods,  
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Files,  
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We invite the attention of the trade to our Celebrated American Horse Rasps and Files. These Rasps are made from the very best American Steel, all cut by hand, and we warrant them equal to any other make in the market. For the information of persons unacquainted with our goods, we will state that every File or Rasp manufactured by us, since our establishment in 1866, have been stamped "Heller & Bros." though commonly called the "Heller Rasp." All Rasps not stamped as annexed diagram are not genuine. We will send sample lot, if requested, and if not as represented they can be returned, or held subject to our order, free of all charges. For sale by the leading Hardware Dealers in the United States.



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HORSE SHOE NAILS.

Manufactured from the best of NORWAY Iron,  
and warranted to give entire satisfaction.

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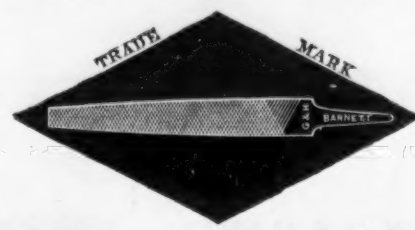
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Sole Agents for the Pacific Coast, 3 & 5 Front St., San Francisco, Cal.  
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Established 1816.

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SOLE AGENTS FOR

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## FILES AND HORSE RASPS,

And Importers of

P. S. STUBS' FILES, TOOLS & STEEL,

W. J. Davies' Sons' London Emery Cloth,  
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Superior Hand-Cut

## FILES AND RASPS,

MADE FROM IMPORTED STEEL. EVERY FILE WARRANTED.

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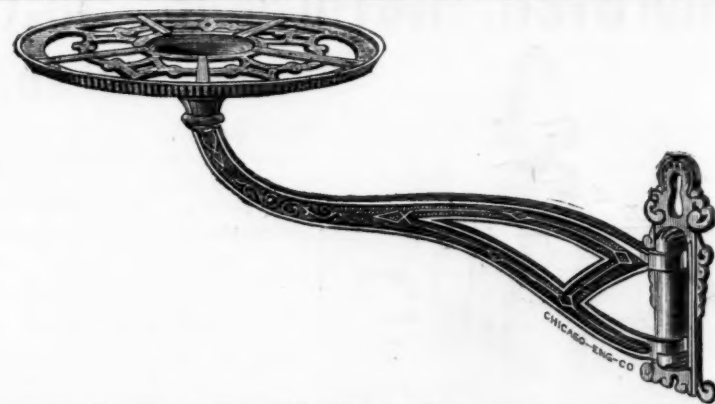
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## Celebrated Hand-Cut FILES,

Made of Best English Cast Steel.

WALSH, COULTER & FLAGLER, Sole Agents,

83 Chambers and 65 Reade Streets, N. Y.



Flower Pot Brackets, Flower Pot Stands, Aquaria, Ferneries, Bird Cage  
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Send for a Catalogue.

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## Tredegar Horse and Mule Shoes.

These superior Shoes are made of the Best Virginia Charcoal Iron. They are well adapted to Western and Southern demand, and are shipped to all prominent markets at freights as low as on other makes.

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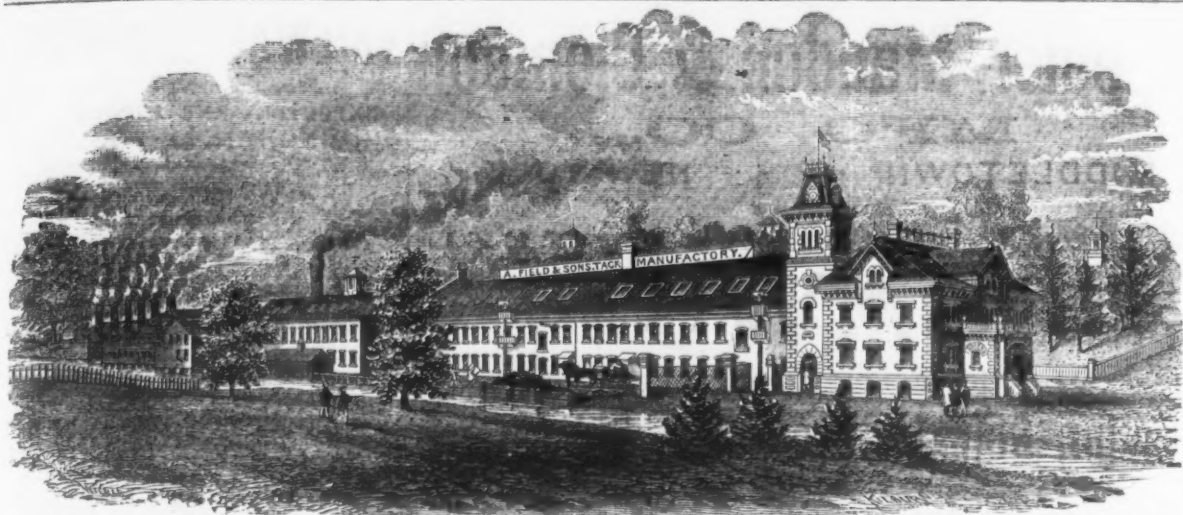
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## A. FIELD & SONS,

TAUNTON, MASS., Manufacturers of  
COPPER & IRON TACKS, TINNED TACKS,

SUPERIOR SWEDEN IRON TACKS, for Upholsterers' Use, Saddlers' Supply, Card Clothing, etc., etc.

American and Swedes Iron Shoe Nails,

Zinc and Steel Shoe Nails, Carpet, Brush and Gimp Tacks, Common and Patent Brads, Finishing Nails, Annealed Trunk and Clout Nails, Hob and Hungarian Nails, Copper and Iron Boat Nails, Patent Copper Plated Tacks and Nails.

Fine Two Penny & Three Penny Nails, Channel, Cigar Box & Chair Nails, Leathered Carpet Tacks, Glaziers' Points, Etc.

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Any variations from the regular size or shape of the above named goods made from samples, to order.

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FINE METAL WORKERS,

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NEW AND ARTISTIC DESIGNS FOR

Private Residences, Banks, Churches and Public Buildings.

## OTIS PASSENGER —AND— FREIGHT ELEVATORS

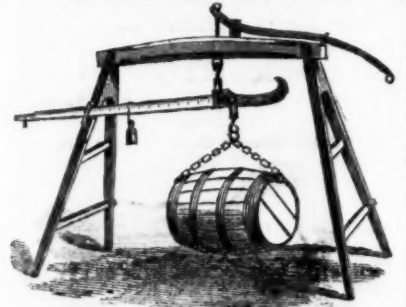
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OTIS BROTHERS & CO.

SOLE MANUFACTURERS,  
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SPRING BALANCES,  
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Stretches the wire each way, is  
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COLD AND WARM BLAST CHARCOAL IRONS,

American and English Bessemer Irons, Iron Ores.

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Send for Prices and further information.

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## F. F. ADAMS & CO., ERIE, PA.,

Manufacturers of

## PATENT WOODEN ARTICLES.

We make a specialty

Walnut and Ash Wainscoting,

Step Ladders, Extension Ladders, Clothes Horses, Towel Rollers,

RAT TRAPS, &c.,

And have Facilities for the Manufacture of Straight and Irregular Turned Work.

### Price's Retort Furnace.

Mr. C. W. Siemens has written the following  
in reply to the remarks made by Mr. L. L.  
Bell, in the paper on Price's Retort Furnace,  
published in our issue of Oct. 14th:

Sir: In a paper read by Mr. Bell before the  
Iron and Steel Institute, describing Price's  
patent retort furnace, allusion is made to the  
Siemens furnace, and I shall be obliged by  
your allowing me to say a few words in reply.  
It is stated, "the preliminary conversion, how-  
ever, of the coal into a gas is attended with a  
certain amount of loss, inasmuch as the whole  
of the fixed carbon is burnt to the condition of  
carbonic oxide, which means a sacrifice of  
about 30 per cent. of its heating power." This  
would be perfectly true if solid carbon were  
employed without decomposition of water, but  
as common coal is the fuel burnt, the actual  
results are different. In the gas producer three  
operations are performed; in the lower portion  
the fuel is burnt, and this may be called the  
zone of combustion; higher up the carbonic  
acid takes up a further equivalent of carbon,  
becoming carbonic oxide; this may be called the  
zone of carbonization; whilst at the uppermost  
layer of the producer hydrocarbons are pro-  
duced in what may be called the zone of distilla-  
tion. The temperature of the first zone would  
be about 2400 deg. C., and that of the second  
about 900 deg. C., provided no water was ad-  
mitted with the air for combustion. The mixture  
of carbonic oxide and nitrogen resulting from  
this reaction, and at the temperature of 900 deg.  
C., has still all the work to do, which is accom-  
plished in a gas retort, namely, to deprive the  
coal of its hydrocarbons and vaporous constitu-  
ents, amounting to from 30 to 35 per cent. of the  
weight of fuel supplied; the work done in this  
third or uppermost zone of the gas producer may  
be valued at 300 heat units per pound of fuel  
charged, which would deprive the hot gases of  
270 deg. C. of temperature, reducing that tem-  
perature to 630 deg. In practice I find that the  
temperature of the gas producer chamber does  
not exceed 400 deg. C., the difference being  
due to further useful work performed by the  
heat resulting from the first operation, namely,  
in the decomposition of water introduced be-  
low the grate in a pool, into which the hot  
clinkers falling generate steam, and which  
must be delivered in the proportion of at least  
1007 lb. per pound of fuel, or 6 lb. per ton. It  
is therefore evident that the loss of heat caused  
in converting the fuel to the gaseous condition  
amounts only to 12½ per cent. of the total  
quantity in the fuel, and this even is turned to  
useful account by causing an onward pressure  
toward the furnace, in the passage of the gas  
through the cooling syphon, thus avoiding the  
necessity of an artificial blowing apparatus, and  
a closed grate, which would be sources of  
considerable inconvenience in practice.

As against this small theoretical loss must be  
set the advantages of perfect combustion in the  
furnace, into which gas and air are admitted  
through valves in proper proportions, and the  
further main advantage resulting from the  
application of the regenerators, which I need  
not here particularize.

The unfavorable estimate which Mr. Bell has  
formed of the working condition of the gas  
producer has betrayed him into under-estimating  
the practical saving realized by the adoption  
of the regenerative gas furnace. The amount  
of this saving depends in a great measure  
upon the temperature at which the work in the  
furnace is being accomplished, the economy  
increasing with the degree of that temperature.  
Thus, in melting mild steel in crucibles, an  
operation requiring intense heat, about 3 tons  
of Durham coke is required in the old process  
per ton of steel melted, which work is accom-  
plished in the regenerative gas furnace with a  
consumption not exceeding 25 cwt. of ordinary  
coal. In carrying out such operations as the  
melting of glass and the reheating and puddling  
of iron great saving has also been effected, but  
one of the largest applications of the system  
has been made to the reheating of Bessemer  
steel, requiring, as is well known, less intense  
heat than is required for the heating of glass  
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Smith's paper, read before the Iron and Steel  
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C. WILLIAM SIEMENS,

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October 20, 1875.

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broken out of the seam in blocks of any desired  
size; the mines are easily drained.

5. The land on the surface is amply able to  
support by its products all, and five times as  
many, as can work below it.


6. Five railroads—one nearly completed—  
cross the field all along an arc from the south-  
west to northwest, probing every available out-  
crop and accessible seam, and assuring the  
manufacturers, by their competition, against  
unjust freight charges.

7. The field is practically inexhaustible, as  
there is block coal enough in it to make all the  
iron of the world, and supply all its fuel for a  
thousand years. To this source must be at-  
tributed the rapid development of our iron in-  
dustry. The amount of coal brought to the  
city in 1873 was 268,560 tons, costing \$1,300,000,  
against \$1,213,000 in 1872, and about \$600,000 in  
1871.

This is now the third in value of products,  
and second in number of men employed. Un-  
til 1848, or after the completion of the first  
railroad, it was, though sedulously nursed by  
some few citizens of more ardent than capital,  
a very feeble and uncertain industry. A foundry  
was established in 1832 west of the river, and  
maintained for a few years, but failed finally.  
Others followed, with little more success. But  
with the advent of railway facilities a change  
came, and some machine shops and foundries  
were started then that would not know them-  
selves in their present huge proportions. The  
coal, though known and used to some extent  
as early as 1850 or 1851, was not understood as  
it is now. Its peculiar fitness for iron work  
was still a secret. And it has come into gen-  
eral use within little more than a decade. But  
the city was the center of a great and rich agri-  
cultural region, and needed engines and mill  
gearing, and threshing machines, and other im-  
plements, and came here for them. This was  
the first impulse. The manufacture of iron  
followed the manufacture of implements from  
iron. The development was rapid, and is in-  
creasing steadily, enlarging old establishments,  
creating new ones, and bringing her successful  
ones long established in neighboring cities. Now  
the city makes all kinds of stoves and  
hollow ware, gas posts, water and gas pipes,  
house fronts, railings, rails, jalls, bars, rods,  
engines, mill work, saws, files, edge tools, mal-  
leable iron and the like, to the amount, in 1873,  
of \$3,800,000, employing \$2,300,000 of capital  
and 1500 men, representing a population of  
6000. The city's situation, its connection with  
the "block" coal field, its railway facilities,  
and the success of its iron enterprise, attested  
by their steady growth in spite of the general  
depression, are very sufficient indications that  
it is the right place for the manufacture of  
Bessemer steel and the smelting of iron.

The great testing machine at the Washington  
navy yard has a capacity of about 300 tons, and  
has been in use 35 years. Quite recently Com-  
mander Beardslee subjected it to a stress of  
288,000 lbs., but it subsequently broke down  
under about 100 tons. The connecting bar  
which gave way had a diameter of 5 in., and  
should have originally had a strength of about  
1,000,000 lbs. Examining it after rupture, the  
fractured section was found to exhibit strata of  
varying thickness, each having a characteristic  
form of break. Some were quite granular in  
appearance, but the larger proportion were dis-  
tinctly crystalline. Some of these crystals are  
large and well defined. The laminae, or strata,  
preserve their characteristic peculiarities,  
whether of granulation or of crystallization,  
lying parallel to their axis and extending from  
the point of original fracture to a section about  
a foot distant, where the bar was broken a sec-  
ond time, and purposely, under a steam ham-  
mer. It thus differs from the granular struc-  
ture which distinguishes the surfaces of a frac-  
ture suddenly produced by a single shock, and  
which is so generally confounded with real  
crystallization. This remarkable specimen has  
been contributed by the Navy Department to  
the cabinet of the Stevens Institute of Tech-  
nology.



**GEORGE GUEUTAL & SON,**  
39 West 4th St., New York.  
IMPORTER OF  
 **Wood Screws, Steel in Sheets,**  
**BAND SAWS. TOOLS FOR BRAZING, &c.**  
Bed Screws, Pin Hinges, and Wire Nails a Specialty.

**H. W. PEACE,**  
MANUFACTURER OF  
**Saws of all kinds.**  
FACTORY, WILLIAMSBURG, N. Y.

 **Elliptic Forked Saw Frame.**  
Patented June 28th, 1870.  
The annexed engraving represents my ELLIPTIC FORKED SAW FRAME, which commands itself to the trade for its simplicity of construction. The Forked Frame being all in one piece, without any center bolt, secures for the Frame great strength and durability. These Frames are put up with my best Webs, marked "No. 40, Harvey W. Peace."  
**HARVEY W. PEACE,**  
Sole Proprietor & Manufacturer,  
**VULCAN SAW WORKS,**  
WILLIAMSBURG, N. Y.

**AMERICAN SAW CO.,**  
Manufacturers of  
**Movable Toothed Circular Saws,**  
**PERFORATED CROSS-CUT SAWS**  
And **SOLID SAWS** of all kinds. Trenton, N. J.

**THE SILVER STEEL**  
**DIAMOND CROSS-CUT SAW.**  
**\$1.50 Per Foot.** Patent Secured

THIS new Saw, which is destined to take the place of all Cross-cut Saws in point of **SPEED AND EASE**, is manufactured by **E. C. ATKINS & CO., Indianapolis, Ind.**, who are the **SOLE MANUFACTURERS FOR THE UNITED STATES.** So confident are we that this is the best Cross-cut Saw in the market that we **CHALLENGE THE WORLD.** Orders promptly filled.  
**E. C. ATKINS, H. KNIPFENBERG.**  
Saw Manufacturers and Repairers, Indianapolis, Ind.

**Lloyd, Supplee & Walton,**  
**HARDWARE FACTORS.**

MANUFACTURERS OF  
**Bonney's Hollow**  
**AUGERS.**

**Stearn's Hollow Augers**

and Saw Vises

Bonney's Spoke Trimmers

Double Edge Spoke Shaves

Adjustable Gate Hinges

Scandinavian Pad Locks

Flat Key Brass and Iron Pad Locks, &c., &c.

625 Market St., Phila., Pa.

**WILLIAM A. DODGE,**  
**Commission Hardware,**  
96 Chambers Street, New York City.

AGENT FOR

American File Co.'s Files.  
J. M. King & Co.'s Stocks and Dies.  
Blake Bros' Butts, Pullies, &c.  
Greenfield Tool Co.'s Planes.  
N. S. Brooks' Screw Eyes, Hooks, &c.  
Watson & Co.'s Cotton, Wool & Horse Cards.  
Thrall's Try Squares, Bevels and Rules.  
J. P. Verree's Hammers and Edge Tools.  
Judd & Hinkley's Snaps, Sash Fast, &c.  
H. Wilkinson's Mincers and Screw Drivers.  
Bliss & Co.'s Hand and Bench Screws.  
T. T. Rhodes' Saw Handles.

American Screw Co.'s Rivets and Screws.  
Sullivan's Saw Sets.  
Dodge's Kentucky Cow Bells.  
Holroyd & Co.'s Stocks and Dies.  
C. S. Griswold, Augers and Bits.  
Romer & Co.'s Pad Locks.  
Wm. Cleveland, Star Faucets.  
Hullock's Rabbit Metal.  
Coville's Hardware Co. Mincers, &c.  
Robbins' Cotton Lins.  
Amidons' Braces.

**NEW HAVEN NUT CO.,**  
MANUFACTURERS OF  
**HOT PRESSED NUTS**  
Of Superior Quality of all sizes, both  
**HEXAGON & SQUARE,**  
From 1/4 inch to and including 1 1/2 inch Bolt.  
Factory and Office. - - - - - **WESTVILLE, CONN.**

**Wheeler, Madden & Clemson**  
**MFG. CO.,**  
MIDDLETOWN, - - - - NEW YORK.  
Manufacturers of

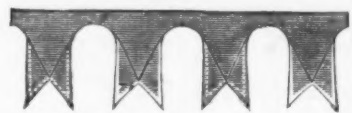
**WARRANTED CAST STEEL**

## SAWS

Of every description, including  
Circular, Shingle, Cross-Cut, Mill, Hand,  
**WOOD SAWS, Etc., Etc.**

**E. M. Boynton,**  
80 Beekman Street,  
**NEW YORK,**  
Manufacturer of  
**Saws of all kinds.**  
Also Sole Manufacturer of  
**LIGHTNING SAWS.**

Two Direct Cutting Edges, instead of one Scraping point.



Note extra steel and durability over the old V, outlined on M tooth.

Telegram Dated Oct. 1st, 1874.

STATE FAIR, EASTON, PA.

To HENRY DISTON & SONS:

Philadelphia, Pa.

I want you to publicly test that challenge on Cross Cut Saws. Name time and place within thirty days. American Institute preferred. **E. M. BOYNTON.** Henry Diston & Sons, dare not respond.

**E. M. Boynton** gave on Wednesday of last week an exhibition of what his Lightning Saw could do at the Pennsylvania State Fair, in which two men sawed through a sound oak log, 16 inches in diameter, in 17 seconds. Mr. Boynton informs us that his export trade is increasing, he having lately made large shipments of his saws to Australia and other distant markets.—*The Iron Age*, Oct. 8, 1874.

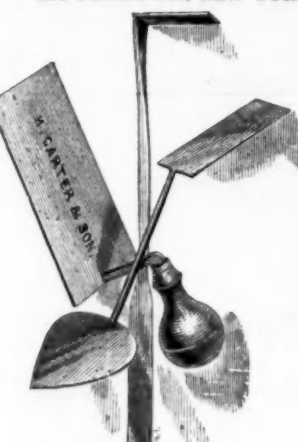
For fuller report of this exhibition see the *Easton Morning Dispatch* of Oct. 1st, 1874.

Henry Diston & Sons cannot furnish Lightning Saws. Why do they imitate mine?

**J. FLINT,**  
Manufacturer of  
**ALL KINDS OF**  
**SAWS**  
And Plastering Trowels,  
**ROCHESTER, N. Y.**

A large Stock of Cross Cut Saws constantly on hand. Orders filled promptly. **Dietrich's Double Handle One Man Cross Cut Saw** made with any kind of tooth desired. Our patent method of grinding Hand Saws makes them superior to any in the market. Send for Illustrated Price List.

**H. CARTER,**  
290 PEARL ST., NEW YORK.

 **Moulders' and Plasterers' Tools.**

Manufacturers of and Dealers in all descriptions of Moulders and Plasterers' Tools, and Dealers in General Hardware, Gilded Copper Weather Vanes, CARTERS' PATENT CARRIAGE LIFTING JACK, &c.

 **ROMER & CO.,**  
Established 1857. Manufacturers of Patent Scandinavian or Jail Locks. Brass Pad Locks for Railroads and Switches. Also, Patent Stationary R. R. Car Door Locks. Patent Piano and Sewing Machine Locks. 141 to 145 Railroad Avenue, NEWARK, N. J. Illustrated Catalogue sent on application.


**VAN WART, SON & CO.**  
Hardware Commission Merchants.  
EXPORTERS AND IMPORTERS,  
**BIRMINGHAM, - ENGLAND,**  
Agents.

**VAN WART & MCCOY,**  
184 & 186 Duane Street, N. Y.  
**George H. Gray & Danforth,**  
48 India Street, Boston.  
**F. W. TILTON,**  
17 Old Levee Street, New Orleans.

At each of these places a complete assortment of samples of Hardware and Fancy Goods will be found, including all new descriptions. Sole Agents for **John Himmer & Son's Celebrated Harness and other Needles.** **W. Clark's Genuine Horse Clippers.** **Seydel's "Ashantee" Pocket Hammer.** **OSCAR IRVING VAN WART & Co.,** FORWARDING AGENTS. 2 South John Street, LIVERPOOL.

**JOHN MAXHEIMER,**  
Patented,  
June 3, 1862; April 6, 1869;  
Dec 23, 1873; Jan. 20,  
1874; Dec. 22, 1874.  
Manufacturer of  
 **BIRD CAGES.**  
JAPANNED and  
PATENT EUREKA  
Bright Metal  
Nos. 247 & 249 Pearl Street  
**NEW YORK.**

**LE COUNT'S**  
**Pat. Machinists' Tools.**  
REDUCED PRICES.  
Set Iron Dogs, 1/2 to 2 in. .... \$ 5.60  
" " " 2 to 4 in. .... 12.00  
" Steel " 1/2 to 2 in. .... 6.30  
" " " 2 to 4 in. .... 13.00  
**Iron and Steel Clamps, Die**  
**Dogs, Clamp Dogs,**  
**Vise Clamps, Expanding Mandrels, &c.**  
Send for latest Price Lists to  
**C. W. LE COUNT,**  
South Norwalk, Conn.

 **JAMES OHLEN**  
WARRANTED  
**PATENT ... GROUND**  
SECOND TO NONE  
COLUMBUS, O.  
make a specialty of the **LARGEST SIZES** of Circular Saws, and call particular attention of lumber manufacturers to the following points of excellence: **Evenness of Temper.**—The peculiar structure of my furnace subjects all parts of the saw to a DEAD heat, and when dipped in the oil bath secures perfect uniformity. **Perfect Accuracy in Thickness.**—My saws are ground on a patent machine, automatic in its operation, grinding off the thick places upon the plate before the thinner parts are reached, and when the saw is removed **BALANCES PERFECTLY**, which is proof positive of the right accomplishment of the work. **Properly Hammered.**—Great care is taken that no saw shall leave my works without due attention in this important particular. A saw too tightly strained upon the rim, or too loose in the center, cannot be successfully run—hence the importance of so hammering the saw as to effect equal strain in all its parts, and at the same time **RUN TRUE**. This department is under the personal supervision of myself, who has devoted over twenty years to the art of saw making. I am sole proprietor and manufacturer of the celebrated "**Challenge**" Cross-Cut Saw. Price Lists of all kinds of saws sent on application.  
**JAMES OHLEN.**

**AMERICAN LOCK MFG. CO.,**  
Manufacturers of  
**FELTER'S**  
**Locks & Latches,**  
Comprising  
Store Door Locks, Night Latches,  
Drawer, Desk and Pad Locks,  
All of which are furnished with  
**SMALL, FLAT, AMERICAN STERLING METAL KEYS,**

Which are stronger than steel, and cannot be affected by rust, and will remain bright and clear under all ordinary circumstances. A candid examination will convince the most unbelieving, that for simplicity, durability, convenience, and safety, they challenge comparison with any now before the public. Being made entirely by new and expensive machinery, especially constructed to manufacture them, they will rival the best made Locks in Finish and perfect operation. These Locks give perfect satisfaction, because they are the safest, cheapest and most durable Lock ever presented to the public, having thirty-five finely finished Brass Tumblers in each Door, and twenty-eight in each Drawer Lock, each one being finely false notched. Each tumbler bearing on the key at two different points while locking or unlocking, without the aid of springs, which cannot be said of any other patent Tumbler Locks in use.

**THE LOCKS ARE FITTED TO THE KEYS**  
And not the Keys to the Locks.  
Hence Counterfeit Keys cannot be made.  
For descriptive list and terms, address  
**AMERICAN LOCK MFG. CO.,**  
OFFICE AND WORKS, Cazenovia, N. Y.,  
Or, **UNION NUT CO., Agents,**  
75 Beekman Street, New York.

 **FULL SIZE OF KEY.**

**Bemis & Call Hardware & Tool Co.**  
 **PATENT COMBINATION WRENCH.**  
These Wrenches are made from the best of Wrought Iron, with Steel Head and Jaw, Case-hardened throughout, and not only combine all of the superior qualities of our cylinder or Gas Pipe Wrenches, but also all requisite combinations of a regular Nut Wrench, thus making a Combination which has no equal.

For Circulars and Price List, address,  
**BEMIS & CALL HARDWARE & TOOL CO. Springfield, Mass**  
**V. G. HUNDLEY,**  
79 Reade Street, New York. Agent for

 **North Carolina Handle Co.,**  
(WILSON & SHOBER, Proprietors.)  
Manufacturers of **SPOKES, AXE, PICK, SLEDGE, HAMMER, HATCHET, and other Handles.** Full assortment always on hand.



## Cutlery.

**LAMSON & GOODNOW MFG. CO.,**  
Have Opened an Office at

**88 Chambers St., New York,**  
For the Sale of their

## American Table Cutlery.

BUTCHERS', COOKS', AND HUNTERS' KNIVES, Etc., Etc.  
Carvers with Gardner's Patent Guard and Rest.

FACTORY. - - - SHELburne FALLS, MASS.

**NORTHAMPTON CUTLERY CO.,**  
Manufacturers of all kinds

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Cook, Butcher, Shoe and Hunting Knives. Sole Agents for Rogers' Cutlery Co.

Plated Forks and Spoons. **THEODORE WEED, Manager, 45 Murray Street, N. Y.**

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Pen and Pocket Cutlery, Solid Steel Scissors, F. & L. Shears, Razors,  
Russia Leather Straps, Oil and Water Hones, &c.

Sole Proprietors of the renowned full concave patent

**"ELECTRIC RAZORS."**

Also Agents for the **BENCALL RAZORS.**

**American Table Cutlery, Butcher Knives, &c.**  
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TABLE KNIVES AND FORKS OF ALL KINDS,  
AND ORIGINALLY EXCLUSIVE MAKERS OF



Also the exclusive makers of the "Patent Ivory" or Celluloid Knife, which is the most durable  
White Handle Knife known. These Handles never get loose. Always call for the "Trade Mark"  
on the blade. Warranted and sold by all dealers in Cutlery, and by the  
**MEHIDEN CUTLERY CO., 45 Chambers Street, New York.**

**THE MILLER BROTHERS CUTLERY CO.,**  
Manufacturers of

**PATENT FINE PEN & POCKET CUTLERY**  
WEST MERIDEN, CONN.

The only Knives made that are put together in such a manner that there is no strain on the covering or frail part of the knife. We warrant our knives equal in cutting qualities and workmanship to any made, and are acknowledged by English makers as the **Best American Knife.** We also make

**NICKEL & SILVER PLATED POCKET KNIVES**  
which will not rust or become discolored when used as a Fruit Knife, and their cutting qualities are equal to any other knife. Orders filled from the factory, and in New York by Messrs. J. Clark Wilson & Co., No. 81 Beekman Street (who have a full stock of all patterns always on hand), and also by Messrs. G. B. Walbridge & Co., No. 99 Chambers Street.

**Naugatuck Cutlery Co.,**  
Manufacturers of FINE

**PEN and POCKET CUTLERY.**

FULLER BROTHERS, Sole Agents, 89 Chambers and 71 Reade Sts., N. Y.

**JOSEPH RYALS, Collinsville, Conn.,**  
Manufacturer of Patent



**SHEARS & SCISSORS.**

Made by a new process **RECENTLY PATENTED** which enables me to produce goods that in quality, finish and general excellence surpass any. All warranted Solid Cast Steel Blades.

ESTABLISHED 1853.

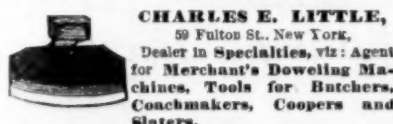
**NEW YORK KNIFE CO.**  
MANUFACTURERS OF SUPERIOR

**Table & Pocket Cutlery,**  
WARRANTED TO BE MADE OF THE BEST

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**WALKILL RIVER WORKS,**  
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**CHARLES E. LITTLE,**  
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Dealer in Specialties, viz: Agent for Merchants' Dwellings, Machines, Tools for Butchers, Coachmakers, Coopers and Slaters.

Silver & Deming's Coach Machinery, Iron and Wood Truss Hoops, all sizes.  
Tool Chests, First-Class Tools.  
Send for Price Lists.

**KANN & SONS MFG. CO.**  
Manufacturers of Albata & Britannia

**TEA and TABLE SPOONS,**  
Caster Frames, Ladles, &c.

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**Table & Pocket Cutlery,**  
Solid Steel Shears, Britannia Spoons, Britannia Soap Ladles and Toy Castors.

OFFICE & WAREHOUSE, 106 Chambers Street, near Church, New York. Sent for Price List.

**AMERICAN**  
PEN AND POCKET KNIVES,  
MANUFACTURED BY **PEPPERELL,**  
AARON BURKINSHAW, MASSACHUSETTS

My Blades are forged from the best Cast Steel, and warranted. To me was awarded the GOLD MEDAL of the Connecticut State Agricultural Society; also a 1st and 2nd Diploma from the Mass Mechanics' Ass'n Sept. 1874.

**HALL, ELTON & CO.,**

Electro Plated Ware, German Silver and Britannia Spoons.



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**George Wostenholm & Son,**  
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**Celebrated I-XL Cutlery, Razors, &c**

AGENT FOR

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CORPORATE MARK

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Granted 1777

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**HARDWARE, CUTLERY, GUNS, &c.**

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The demand for Joseph Rodgers & Sons' productions having considerably increased, they have, in order to meet it, greatly extended their Manufacturing Premises and Steam works. To distinguish Articles of Joseph Rodgers & Sons' Manufacture, please to see that they bear their Corporate Mark.

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**GEO. WOSTENHOLM & SON,**  
CUTLERY AND RAZORS,

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CORPORATE MARK



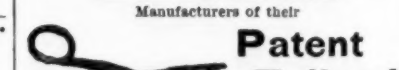
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**R. HEINISCH'S SONS,**  
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Manufacturers of their



**Patent**

**Tailors' Shears.**

SCISSORS AND TRIMMERS.

301 Broadway, NEW YORK.

**FURNESS, BANNISTER & CO.**  
Manufacturers of

**Fine Table CUTLERY.**

Cor. Nassau & Sheffield Sts.,

NEWARK, N. J.

## PHILADELPHIA CORRESPONDENCE.

PHILADELPHIA, Nov. 15, 1875.

While attention is so generally attracted to the condition of the iron trade as to induce the secular press to devote columns to it, principally made up of clippings from the trade journals, and conveying nothing of novelty to those within the trade itself, there is a great deal of the inside history of the business which never gets into the papers. Could the actual amount of business done be thoroughly reported, it would be seen that there is more of activity than is believed. The position of the trade, when looked at from a standpoint on the edge, as it were, neither affected by the interests of those within its inside circles, or without as purchasers, shows a depression by no means greater than in other branches of industry, except so far as that the iron business looked principally to one purchasing interest, viz., the railroads, and until these recuperate through the general improvement of all other interests, prosperity may not return to it. But prosperity and inflation are widely different conditions, and the amount of business which shall create the one and stop short of the other, is nearer at hand than most concerned are willing to admit. The theory that the productive capacity of the country is far in excess of its possible wants for years, is one born of the complete prostration incident to the panic times, and popularized because of the general belief that we must have done too much at one time not to be able to do anything at another. This truth will be more apparent when we shall have recovered from the present state of affairs. Taking into account the fact that we have practically ended importations of iron from Great Britain—for no improvement in our home trade will ever again admit foreign iron at a profit, unless irrational legislation shall repeal or greatly reduce our tariff laws—it is to be considered how the enormous amounts of material imported in 1872-73 are to be supplied, as and when the business of the country shall revive with, say, the increase of population of three years' comparative idleness. Admitting that one-half of the furnaces of the country can now supply the present trade, will the other half furnish the additional amount necessary to fill the hiatus from stoppage of foreign importations when trade reaches its natural activity? Scarcely. The secretary of the Iron and Steel Association told us this fall that there was more rolled iron, exclusive of rails, made and consumed, for it is not in stock, in 1874, than ever before in any one year. Evidently this amount of rolled iron only just supplied the demand of a year when a majority of the consuming industries were either closed or running on part time. These mills also took, in connection with the foundries, the product of half the furnaces, but will these mills be able to supply treble the product of 1874 in 1877 or 1878? Clearly not. True, the substitution of steel for iron will, in a measure, render many of the iron roll mills idle, but this will be obviated by the introduction of the Siemens-Martin steel plant in such, and a change from the sole production of rails to more varied products. It is to the possible temporary interest of the iron trade to discourage its extension in new regions or localities where production is likely to be less costly, but it is not to the true interest; since the return of prosperity, a foreign war, the discovery of any great and new mineral region, or even a settled plan of finance, would, any or all of them, send prices, if not up to the rates of '72, at least far too high for the future well being of the trade, since likely to open the door again to foreign importations and to beget another panic. Hence, if we are right in our view, which is based upon convictions strengthened by considerable experience, we are likely to see a healthy and, indeed, active employment for a majority of our existing iron works before the most of those in the trade expect it. The market reports of the week will show that the general reduction in prices is having its effect, and has brought some of the principal consumers on the market, either for supplies for present use or purchases for future possibilities of demand.

For the rest, the gossip of the week is principally of a Centennial-istic character. The buildings are nearly done, and will soon be turned over to the authorities. Horticultural Hall is, indeed, practically finished, and heat has been supplied to the building and plants placed in it. Memorial Hall is to be supplemented by an additional art building in the same style of architecture. The Commission from the Netherlands has arrived in the persons of Admiral Casembroot and Dr. Jouekbloot. The Royal Swedish Commissioner, Mr. Daunfelt, also arrived during the week. Sweden will make her chief exhibits of iron, and if they would only give us the secret of making it it would be well. We have the ores, the fuel and the labor, but something of the mysterious secret is wanting. A Swedish schoolhouse and a Swedish iron clad will swell their exhibits, and the latter will transport most of them here. The tanners, leather dealers and shoe manufacturers combine to erect a building devoted to their trade, and, indeed, all the industries represent more activity than iron and its kin, but that will doubtless hold its own.

The University of Pennsylvania has done a generous act in offering ten free scholarships in the Towne Scientific School to that number of pupils of the city public schools which shall pass the best examination for admission into the freshman class of the scientific school.

The Legislative Investigating Committee of the Reading Coal and Iron Co. has fore-shadowed its report, which is practically like the Irish verdict that "the prisoner is not guilty, but must not do so again!"

The project for a Centennial depot for the Reading Railroad is in danger of being abandoned on account of the failure of the commission to grant the requisite authority.

The contract for the removal of the warehouses at the old Navy Yard to the League Island Station has been let, and work is to be begun at once.

The Baldwin Locomotive Works reports a fair business in South American orders for engines, and is about to introduce a new steam street car, for which, if practical, there will be a lively demand.

The United States frigate Antietam was launched on Saturday at the Navy Yard. Originally intended for a first-class ship she will now be used only for storage, and was sold last spring for \$5500 to Wm. McKay, of your city, but the sale was set aside; and so the floating gossip of the week is ended.

## Black Band Ores in Kentucky.

A representative of the Greenup (Ky.) Independent, who has been prospecting on the Big Sandy, claims to have made some important discoveries, which are described as follows:

The existence of black band ore in the Big Sandy Valley is not any more questioned. This ore, so valuable for its containing a large amount of manganese and carbon, also contains sulphur and phosphorus, both in small quantities and in such proportions that the red short and cold short tendencies of the metal neutralize each other. The diffusion of carbon through the ore both diminishes the cost of roasting and that of reducing it, whilst its manganese greatly facilitates the operation of fluxing, and renders the pig iron produced from black band ore very valuable for the manufacturing of steel. This ore well roasted, yielding from 25 to 50 per cent. of iron, is an excellent material in the blast furnace, is inclined to make gray iron and works remarkably easy. There are now seven principle measures of this ore worked in West Scotland from 16 to 6 inches in thickness, all of which are mined and used to advantage and profit, and yield from 28 to 40 per cent. metallic iron. It is also found extensively in Wales and Rhenish Prussia, but in the States an entirely successful exploration has not been made; the developments near Pottsville, Pa., which I distinctly recollect, were cut out by other strata taking the place of the black band ore. It is said to exist, also, near Frostburg, Maryland, Lewisport, Va., Muhlenberg county, Ky., and in Tennessee.

Unbelieving as I am in most of the flowery reports which are often made me about the discovery of valuable metals in the section, I lent but a deaf ear to Mr. G. R. B. Chapman's description of Black Band ore found on his land situated on both sides of the Louisa Fork six miles south of Louisa. I, therefore, to satisfy myself, accompanied this amiable and clever gentleman to his tract of some 680 acres, which he owns, in partnership with the Hon. John Rice. On the eastern portion of these lands I found the following veins:

- 1st. Thirty inches black band ore.
- 2d. Six feet of coal and shale stain.
- 3d. Four feet of bituminous coal.
- 4th. Thirty-two inches splint coal.
- 5th. Twenty-four inches bituminous coal.
- 6th. Twenty-six inches splint coal.

These veins were all faced in a decidedly rough manner, and lacking the time to take the levels between them, or to make thorough investigation of the coal, which could not have been done without considerable application of a pick or mattock, neither of them being handy, I can only state that I judge the distance between No. 6, which is below high water mark, and No. 1, which is about in the middle of the hill, to be about 200 feet. But I can vouch for the excellent quality of No. 4, which closely approaches in its fracture the nature of canal coal, as well as for the existence of No. 1, the Black Band ore. At first appearance the ore resembles very much the coal shale, of grayish black nature which is generally found in the top roof of canal coal veins, but on closer examination its left and granulation at once satisfies even the superficial observer of its true value.

No. 1 vein had not been run into the hill, yet its thickness and very valuable character are not questionable, the more so as regards the latter, since roasted specimens of it which were presented to me proved its excellence beyond a doubt.

From superficial observation I presume that further in the hill No. 1 and No. 2 veins, because of their proximity and appearance, will unite and thus form one vein of both iron ore and coal, which might be mined at a slight expense.

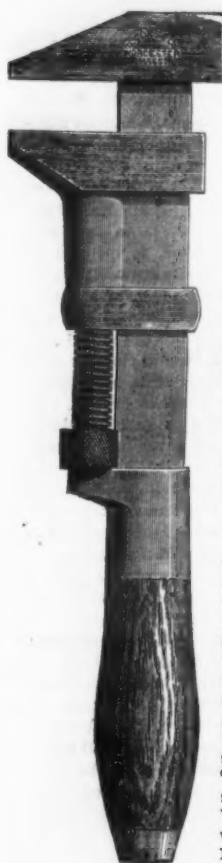
Engineers have at different times directed their attention to the obtaining of a metal which shall be so resistant of the action of partially molten iron as to prevent those accidents which now and again prove painfully disastrous in the working of blast furnaces. The smelting process should go gradually on, the iron steadily exuding, as it were, from the stone as the blast heat operates upon it. Sometimes the partially smelted materials hang, or "pocket," at a little distance above the tuyeres, and after a time come down with a rush. There is risk that during the fall particles of molten iron and cinder may impinge upon the tuyeres, burn them through, and allow the water to escape into the furnace, with the result that the heated mass coming down upon the water so escaped, an explosion ensues. By an accident of this class four furnace men were killed at the Hot Holes Furnace of Mr. Alfred Hickman, near Wolverhampton, not long since. The tuyere in this case was one of seven, and was made of a brand of boiler-plate iron known in the locality for its excellence. With this iron the tuyeres are constructed by the blacksmith of the firm; and if, after doing duty in the furnace, they are found to have become worn they are not wholly cast aside, but are "nosed" with the same class of material. This tuyere had been nosed, and it had been at work some twelve hours before the explosion. Furnace managers tell us—and it was so contended at the inquest in this case—that it is impossible to prevent pocketing and the lodging of portions of incandescent stuff on one or other of the tuyeres. Assisted by the engineers they have, therefore, turned their attention to the obtaining of a material which shall not be eaten through by the hot metal. As we all know, mixed metal, bell metal, and copper have each been in their turn tried, and Mr. Hickman has tried them, with the result that he finds nothing safer than really good boiler-plate iron. If other people's experience has been different to this, we hope that for the benefit of those who have been less successful they will make it known. The columns of the Engineer are open to such information.—The Engineer.



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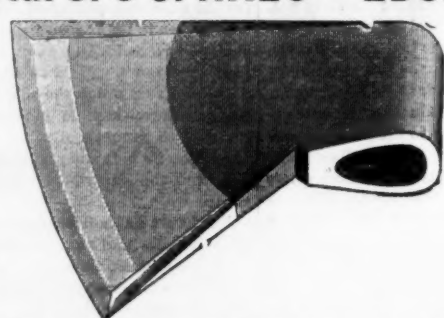
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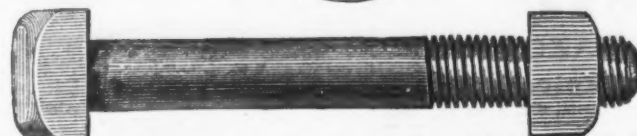
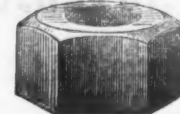
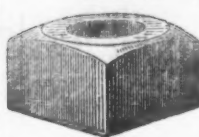
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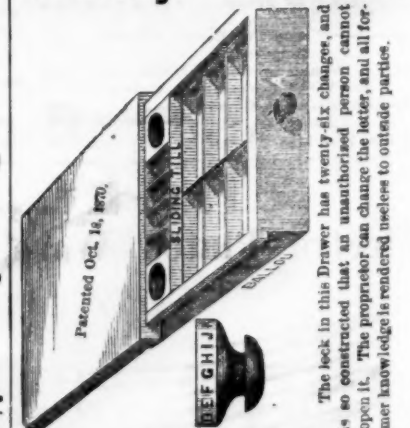
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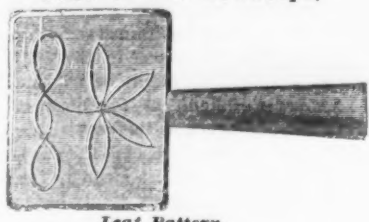


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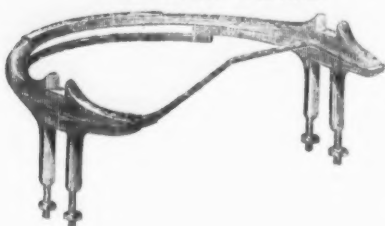


Leaf Pattern.

King Bolt Yokes.



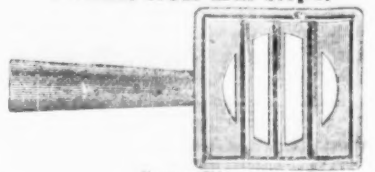
No. 6 Fifth Wheels.



1871 Pattern Shaft Couplings.



Patent Cross Bar Steps.

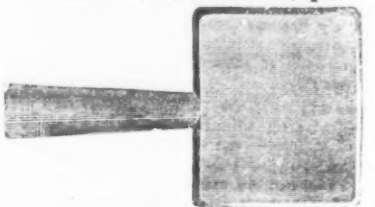


Upper View.

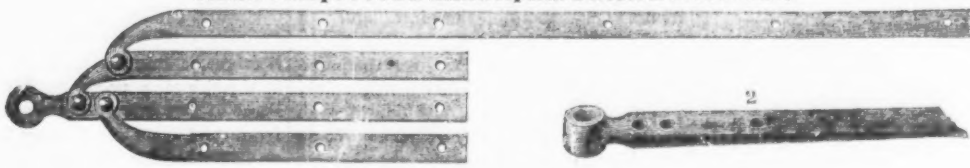


Lower View.

Solid Plain Pattern Steps.



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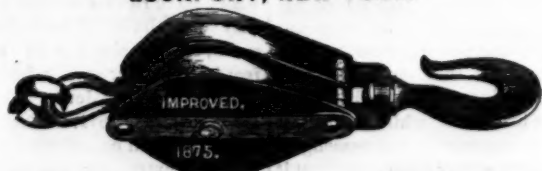
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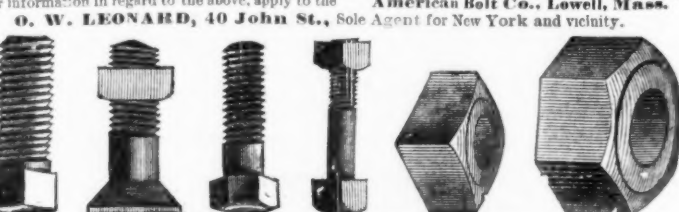
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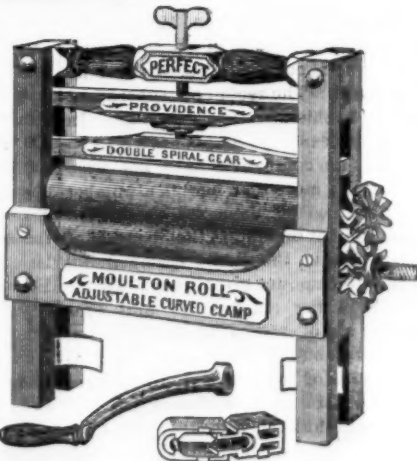
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# The Iron Age.

New York, Thursday, November 18, 1875.

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JAMES C. BAYLES - Editor.  
JOHN S. KING - Business Manager.

New York, January 2, 1875.

Until the 1st instant the postage on newspapers was paid by subscribers at the office where the paper was received, the yearly rates on the different editions of *The Iron Age* being as follows: Weekly, 40 cents; Semi-Monthly, 40 cents; Monthly, 24 cents. Under the provisions of the new postal law, which went into effect on the 1st instant, prepayment at the office of mailing is required, at the rate of two cents per pound for the Weekly, an "three cents per pound for the Semi-Monthly and Monthly, which will make the postage as follows on the different editions: Weekly, 50 cents; Semi-Monthly, 30 cents; Monthly, 15 cents.

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## Congress and the Texas Pacific Railroad.

The *Bulletin of the Iron and Steel Association* takes issue with *The Iron Age* on the views expressed in an article entitled "A Few Words of Caution," which appeared in our issue of the 4th inst. In that article we objected to the attempt which, we are informed, is to be made during the approaching session of Congress, to make the national treasury responsible for interest on the bonds of one or two unfinished railroads to the Pacific, in order that capitalists may be induced to buy these securities and thus furnish the money needed to complete the undertakings. We regret that we cannot make room for the *Bulletin's* article entire; but as its length forbids, we must content ourselves with extracts

which, we think, contain its salient points. We quote as follows:

It is too late in the day to object to governmental aid to private enterprises of national importance. Our government was ordained, among other purposes, to "promote the general welfare;" and it has been held and decided since the days of Henry Clay, if no further back, that the general welfare may properly be promoted by governmental aid in the construction of turnpikes, canals and railroads. Millions of dollars and millions of acres of public lands have been given away in aid of these objects. Our rivers and harbors have been systematically improved by the government, and many of these improvements have been only remotely of national value, as, for instance, the improvement of the Tennessee and Cumberland Rivers. Only last winter Congress passed an act, in addition to the usual river and harbor bill, appropriating money to pay Captain Eads for his jetty at New Orleans—a private enterprise wholly, but one nevertheless of national importance.

Congress has, from time to time, given away large bodies of the public lands for the advancement of education in the several States. The Western States have been especially favored in this respect, and every State had given to it a dozen years ago a share of the public lands for the special purpose of enabling it to maintain one or more agricultural colleges. This last grant not only gave away the property of the whole people, but it gave it away for the benefit exclusively of a special class.

The principle and the policy of governmental aid in behalf of internal commerce and general and even class education being conceded, the only question is, where shall their application end, and of this Congress only can be the judge.

To this we reply: 1st. It is never too late to correct a wrong. Until within a few years money has been appropriated from the National Treasury, and the public credit pledged, only in aid of enterprises which were public necessities. Such exceptions as have been made to this rule have been, we think, mistakes which should not be repeated, and we do not consider that a new railroad to the Pacific is in any sense a public necessity at this time.

2d. What Congress has done in the matter of rivers and harbors, establishes no precedent to guide it in building railroads. River and harbor improvements are public works, and remain under the jurisdiction of the national government; railroads are not public works, and are owned and controlled by private corporations not accountable to Congress.

3d. Grants of public land in aid of education may or may not be wise and judicious. In any case they are granted by the national government to the State governments, and are designed to benefit the people and not to enrich private corporations.

4. Congress is the judge as to where "the principle and policy of governmental aid in behalf of internal commerce," etc., shall end, but who shall be the judge of Congress, if not the people? The fact that the decision of a question rests with the "representatives" of the people of the several States, does not deprive the people represented of the right to hold and express opinions as to the expediency and wisdom of the policy which Congress may see fit to adopt. It is our opinion that millions of acres of public land, which should have been kept for pre-emption and settlement, and as an inducement to immigration, have been recklessly voted away in aid of railroads which were built from the proceeds of mortgage bonds issued to the full value of every mile constructed. Ever since the days of the Credit Mobilier legislation, Congress has been beset with a hungry railroad lobby clamoring for "Aid I said!" If the principle of granting such aid was ever right, it has certainly been overdone. The precedent for such legislation was established in 1850, by the passage of an act granting to the Illinois Central and the Mobile and Ohio railroads, tracts of public land amounting to about 3840 acres to the mile of road built. The record of subsequent legislation in this direction is startling. In a great many cases the grants have been so liberal that the companies have not been able to certify more than half the number of acres claimed by them, for the reason that the amount of land at the disposal of Congress within the limits specified did not equal the amount given away. By the end of 1873 the amount of land thus granted in aid of works of internal improvement amounted to nearly 199,000,000 acres, an area of greater aggregate extent than that of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Indiana and Illinois combined. No doubt this liberality has had a powerful influence in stimulating speculation in railroad building, and in hastening the development of the West in advance of the requirements of commerce, or the necessities of actual settlers. Whether it has been of permanent benefit or not, remains to be seen. The first effects—the reaction culminating in the panic of 1873 and the subsequent prostration of commerce and industry—has been bad enough, certainly, and many millions of capital invested in unnecessary railroads will lie unprofitable and unproductive for years to come.

We have now reached a point when the possession of a title to public land will not enable a company to raise capital when

those with capital to invest see no chance of getting interest on their investments. The Texas Pacific Road was aided with a munificent grant of 18,000,000 acres of public land, by act of March 3, 1871. This is not enough. The promoters of the line ask that Congress shall now make the national government responsible for the payment of interest on the bonds of the company, from the sale of which the capital needed to complete the road is to be raised. This, we think, is asking altogether too much. We are not unfriendly to this or any other enterprise undertaken in good faith by honest, capable men, as we believe the projectors of the Texas Pacific line to be; but we fail to see any reason why the national government should pledge the money of taxpayers for the payment of interest on the mortgage bonds of their road. The principle is wrong, and the precedent would be dangerous in the extreme. On principle, therefore, and not because of any unfriendly feeling to an enterprise in which we discover the possibilities of ultimate public benefit, we object to what we cannot but consider an improper use of the public credit. We do not believe it is necessary to the ultimate completion of the road, that such aid should be extended to it at this time; and if it were, the same argument would apply with equal force to many unfinished railroads whose bonds find no present sale in the market. Many of these roads, undertaken in good faith, and carried forward until the resources of their projectors were exhausted, have never had any aid or encouragement from Congress, and own no real estate except what they have bought and paid for. Their immediate completion would be of benefit to the iron trade, and we should be very glad to see work resumed upon them without delay; but we have no hesitation in saying that we should be very sorry to see the responsibility for the payment of interests upon their bonds saddled upon the national treasury at a time when economy in all public expenditure and a lightening of the burden of taxation, national, State and local, are demanded for the relief of our prostrate industries.

The *Bulletin* considers our advice to the iron trade, not to go into the fight for the maintenance of protection handicapped with the obligation of supporting any unpopular and impolitic demands upon Congress, "cowardly." We confess we do not like the term, nor do we think it fairly applied. To underrate the strength of the influences opposed to protection, or to cherish the delusion that the cause of protection is as strong to-day in the popular favor as it was before the panic, is, we think, unwise. Over confidence is always an element of weakness, and true courage in defence of principle never underestimates the difficulties to be met or the dangers to be averted. Whatever may be the sentiment of the iron trade to-day as regards the questions discussed in this article, we believe the time is not far distant when the views we have expressed will meet with universal acceptance.

## The Revolt in Malacca and the Tin Market.

Telegrams received since our last issue concerning the revolt of the Malay population of the Straits Settlement in Malacca, against British rule, are important as affecting the future of the tin market. The population of the British Empire in India, amounted last year to about 238,831,000, about 211 inhabitants to the square mile. Of this total 140,500,000 are Hindoos, 40,750,000 Mohammedans and 900,000 Christians—the latter including 250,000 resident Europeans. The remainder were Jews, Buddhists and Parsees. Twenty-three languages were spoken in the Empire. In order to keep this population—as great in numbers as of all Europe—in subservience to British authority, there was maintained a standing army of 60,000 Europeans, and a considerable force of Sepoys. At Hong Kong there were some 2000 more troops, accessible by telegraph, and the resident authorities had at command a reputable naval force, and about 6,000 miles of strategical railroads. An empire upheld at such a distance from the seat of government, with a population which includes upward of 40,000,000 fanatical Mohammedans, always ready for insurrection, is, to say the least, a precarious possession, not to speak of the uninterrupted Russian military approach north of Bengal.

With these facts in mind, an insurrection in the Malay Peninsula, which can only be reached by steamer and has no railroads, cannot be regarded as of small consequence. It is not likely that the British government will deal leniently with an insurrection so formidable, and it will probably be suppressed; but the extent to which it will decrease the production and shipments of Straits tin cannot be estimated, until we have fuller advices as to the nature and extent of the revolt and of the resources at immediate command of the British government for its suppression.

A serious feature of the new revolt is found in the fact that when the Mohammedan population in one quarter is profoundly agitated from any cause, as is the case at present in the Turkish principalities, it is more than likely to spread throughout the whole Mohammedan world. An instance of this is found in the Sepoy revolt, following close upon the Crimean war, and what forces may be at work to spread the trouble begun in the Malay Peninsula throughout Hindostan proper, cannot now be ascertained.

Should the disturbances in the Straits settlements acquire an importance beyond the immediate control of the British government, there is every reason to believe that production at the mines of Larote and other localities would be stopped; or if the Chinese miners should continue at work, it might be impossible to forward the tin to the shipping ports for a time. A full force of Chinese laborers is able to extract from the Larote mines about 79,200 piculs, or 4738 tons, per annum. As the Larote district is one of those which the cable informs us is in revolt, the interruption of mining may be serious and, in proportion to the extent of the trouble, protracted. A temporary stoppage of the production or export of Straits tin would have an important influence upon the price of that metal. In 1874 the tin product of Malacca amounted to 7149 tons, and up to the middle of September this year, the shipments from that country to Europe and the United States had amounted to 7133 tons. A stoppage of further supplies from there, taken in connection with a diminished production in Australia, owing to protracted drought, would reduce the world's current production of tin by very nearly one-quarter, an amount about equal to the total available stock in Europe and America at the beginning of the current year.

On the afternoon of Saturday last the limited express, by the Pennsylvania Railroad, from Philadelphia, due here at 2:26 p. m., met with an accident which served to show very clearly the excellence of American car building practice. It was thrown from the track about one mile east of the city of Trenton, and, so far as could be judged from the appearance of the track and switch, the accident was caused by a broken switch stand. The engine passed over safely, but displaced the rails so that the tender jumped the track, dragging after it the mail, baggage, and two of the drawing room cars. Crossing one or two tracks, the cars struck a coal train standing on a side track, and demolished a number of the coal cars, at the same time ripping up and completely wrecking the tracks over which they passed. The road bed itself was damaged considerably, being dug up and ties cut and torn out so that it was necessary to lay tracks around the break. The force of the blow was so severe that the ends of both the baggage and mail cars were completely crushed and shattered. Neither mail agent nor express agent in these cars received any injury, however. The two palace cars following which left the track were uninjured, save that one of them had a platform broken; the car itself, however, was intact. The coal cars which were struck by the train were completely demolished. The tender, which was wrenched from the engine by the shock, was also destroyed. The distance run was very short, as the engineer put on the brakes before the tender went down. The time in which the power had to act was of course very short, but as the parting of the couplings does not throw the brakes off, they continued their effect until the train stopped. The train was a fast one, and running at a high rate of speed, and with the exception of the baggage and mail cars it was made up of heavy Pullman drawing room cars. The weight of that part of the train that left the track with that which did not, could not have been less than 460,000 pounds. Many newspapers have expressed great surprise that no one was hurt, and that so little injury was done to the train. When the construction of these cars is considered, it is nothing to be surprised at, their behavior under the circumstances being precisely what would be expected. The tender, being short, heavily loaded and by no means as strongly built as a passenger car, was destroyed. Those cars that struck the coal train, and rolled loose from their trucks, had their ends broken in, while in the last cars the shock was very light; passengers remarked, "that is a very short stop," but it was not supposed that an accident had happened. In the cars of this pattern the amount of resistance offered by the framing is something enormous. Six sills are commonly used, beside two truss planks or their equivalents. In many cases even more

timber than this is put in. The amount may, we think, be safely set down as about 240 square inches of the best Southern pine, whose crushing stress cannot be less than 6000 pounds per square inch, or a total of 1,440,000 pounds. In the baggage and mail cars the amount of timber is even greater, since they are framed so as to carry heavier loads. To crush in the end of a car thus framed, as might be expected, is exceedingly difficult, as the blow comes upon the platform and its force is seriously diminished before it reaches the car body. With a train of cars less strongly framed, the forward ones must certainly have been crushed or telescoped. Nothing could have prevented it, and the resulting loss of life would, of necessity, have been heavy. The recent accidents in England of a very similar character to this one, but with trains, so far as we can learn, weighing much less, have resulted in large losses of life. The side doors necessary in compartment cars of the kind used there, are doubtless very convenient at stations, but when, through those same doors, the passenger shot out into a mass of debris during an accident, finds himself a part of the general wreck, and is crushed and ground among springs, wheels, sole-plates and panels, he would, it is safe to assert, willingly exchange the convenience for more strength and safety. We say confidently that we do not believe it is possible to build cars with compartments and side doors that can in any way approach the strength of the long American car with end doors. The whole floor and side as far as the window sills, is a unit, and the amount of resistance which is offered is something extraordinary, when compared with the pasteboard coaches used on foreign railroads.

Since writing, a contemporary comes to us with the following editorial mention of the accident, headed "wonderful escape."

How it happens that no lives were lost by the accident on the Pennsylvania Railroad just beyond Trenton, on Saturday, can only be explained upon the theory of marvels. The limited express train, so we are told, was shunted at full speed by a misplaced switch into the rear of a freight train, and there ensued such a destruction of rolling stock and tracks as served to delay travel for hours.

## American Railway Cars.

From personal knowledge of the circumstances of the case, gained at the time, we are able to say there are two errors of fact in the statement. The switch was broken and the train struck the coal train at the side and not the end. It may seem a marvel to some that no lives were lost, but the real marvel would be the loss of life under the circumstances. Accidents to trains will in this country become less and less fatal, as a rule. Yet, we do expect to see some fearful losses of life if certain roads do not abandon old and weak cars, and buy or build stronger ones. The most frightful accidents of the last five or six years were fatal only because of the miserable character of the old, light, weak rolling stock of which the trains were composed. It is not necessary that a road should be equipped with parlor cars to be safe, but it is necessary that the cars should be well built and strong, and this is as possible with the cheapest emigrant car as with the most expensive drawing room car. There are a number of roads not far from this city on which a terrible loss of life may be expected whenever anything happens to trains made up of their older cars. This year, on the 4th of July, a butting collision of trains thus made up caused a fearful loss of life, and people cast the blame upon the management, conductors, engineers, train dispatchers and in fact almost every body. But no one even suggested that with good cars the number killed would have been very small, probably limited to one or two of the most exposed on the platforms.

## The Manufacture of Spiegel Iron.

A paragraph has recently been floating around through most of the trade papers to the effect that there are but two furnaces in this country which make spiegel iron. As the number of Bessemer steel establishments and Siemens-Martin steel works has become so large that the consumption of spiegel iron is quite an item, it may be well to remark that the iron masters of this country are endeavoring with their usual enterprise to supply themselves entirely with American-made spiegel, and that there are more than two furnaces now making this kind of iron.

There are three furnaces in New Jersey which have run on spiegel iron ever since they were built. These furnaces are all small, each being but 20 feet high and 7 feet in diameter as the boshes, and were built by the New Jersey Zinc Company in 1855, 1863 and 1871, at Newark, N. J., to smelt the iron contained in the residuum left after extracting the zinc from the ore. These furnaces have an annual capacity of 5500 net tons. Two of them are now in blast. There are two spiegel furnaces in Pennsylvania. The Bethlehem Iron Company built a furnace expressly to make spiegel,



and blew it in on the 4th of last August. It is a small furnace, 3½ by 10½, and uses Spanish manganiferous ore. The Cambria Iron Company purchased some African ore, and are now making spiegel from it in their Frankstown Furnace in Blair county. This furnace was rebuilt in 1872, and is now 40 feet by 10 feet.

The Woodstock Iron Company, of Aniston, Calhoun county, Alabama, are now running on manganiferous ore, and turning out a good quality of spiegel iron. Their furnace is 43 by 12, and was first put in blast on ordinary pig iron April 13th, 1873, and began to make spiegel in August, 1875.

Beside the above named establishments, Mr. J. Prichard, of Pittsford, Vermont, makes a brand of iron in his furnace which he calls "Vermont spiegel." His furnace is 40 by 10, and was built by the Vermont Iron Co. in 1844.

The furnaces of the New Jersey Zinc Company and the Bethlehem Iron Company are operated on anthracite fuel, that of the Cambria Iron Company on coke, and those of the Woodstock Iron Company and Mr. Prichard on charcoal. The Pennsylvania Steel Company made some spiegel iron during the war in a cupola at their works near Harrisburg, but they have not made any recently. Deposits of manganiferous iron ore are known to abound in many parts of the United States, and it is highly probable that before many years all the spiegel iron the country needs will be made in America from American ores. The consumption of this kind of pig iron is now estimated at from 25,000 to 30,000 tons a year, of which only about 5000 tons have annually been made on this side of the Atlantic up to this year. These figures will be materially changed in 1876, when all the above named furnaces will doubtless be in blast.

#### Coke from the Hanging Rock Coal.

On the 14th inst., Messrs. Bancroft & Rader, proprietors of the Vinton Furnace, drew the first oven of coke made in Belgian ovens of washed coal from the veins of the Hanging Rock region. The results are satisfactory beyond expectation. The coke is unusually free from slate and sulphur, and looks equal of Connellsville make. Still better results are expected when the ovens are fully heated, and no doubts are entertained by the iron masters of the district but that as good iron can be made from the coke of local coals as from those brought from Western Pennsylvania. The results already reached solve the problem of a successful use of Hanging Rock coals in the blast furnace. Owing to the long time necessary to thoroughly heat the ovens, it is not probable that the Vinton Furnace will be put into blast before the first of December, prox., after which, we shall give our readers information concerning the quality of iron made with the new fuel.

By the coking process employed at the Vinton Furnace, it is claimed that almost any coal of a bituminous nature can be made to work well. The coal from which the coke above described was made, is of a very dry, hard nature, and promised little. It is crushed between rollers to a size which will pass a half inch mesh, the slate and sulphur are washed out in a Bradford coal and ore separator, after which it is kept in the ovens for forty-eight hours. Thus far the loss in the washing is about ten per cent., and is all of slate and sulphur. The closest scrutiny has not been able to detect, as yet, any appreciable loss of coal in the washing. We congratulate the proprietors of the Vinton Furnace on the success of their experiment, and commend their enterprise as worthy of imitation.

#### The Woodbury Pressure Bar Patent.

A case of great interest to all manufacturers of wood molding machinery has lately been brought to an issue by the arrest of Col. E. G. Allen, in Athol, Mass., for collecting royalties upon alleged false pretences, under what is known as the Woodbury patent covering the pressure bar. The facts in this case, which may be said to be one of national interest, are briefly as follows:

Twenty-two years ago Mr. J. P. Woodbury applied for a patent on a pressure bar, a device which is now used on every wood planer. His application was rejected on the ground of priority of invention. He then abandoned the claim, and meanwhile, the bar came into general use. On July 8, 1870 an act of Congress was passed which provided, "That when an application for a patent has been rejected or withdrawn prior to the passage of this act, the applicant shall have six months from the date of such passage to renew his application, or to file a new one, and if he omit to do either, his application shall be held to have been abandoned." Under this provision, between the 8th of July, 1870, and the 8th of January, 1871,

thousands of old rejected and withdrawn cases in the Patent Office were resurrected, and either renewed, or new applications were filed. Among them was the application of J. P. Woodbury. A very large number of them (among the others Woodbury's) were rejected on the ground that they had gone into public use since the original application, and consequently a patent could not issue. The Supreme Court of the District of Columbia, to which appeal was made, held in several cases that this law, properly construed, made these pending cases from the time they were originally filed, and that any public use between that time and the time of finally granting the patent, which was without the consent and allowance of the applicant, could not be construed as public use in such sense as to prevent the issue of the patent.

Under this decision Hon. M. D. Leggett allowed the patent to be issued, certifying at the time that he believed its issuance to be wrong, and that in case of litigation the patent would be found invalid. A determined opposition to this patent has been organized and is spreading all over the country. A large meeting of manufacturers in Chicago was recently held, and decisive action taken. The friends of the Woodbury patent, however, of course maintain their ground, and express themselves to the effect that their "case" is good, and will be so adjudged in a court of law. The arrest of Allen is an earnest of the intentions of the opposition to the Woodbury Company's "pressure bar" claims, and there is every indication of a sharp fight.

#### The New Bessemer Plant of the Vulcan Iron Works, St. Louis.

The Vulcan Iron Works, at South St. Louis, Mo., have enjoyed from the start the advantage of intelligent and enterprising management, supplemented by abundant resources of capital. The location was well chosen. Standing on the bank of the Mississippi, and with railroads connecting the city of St. Louis with the great ore beds of both Southern and Southwestern Missouri within a stone's throw of the works, they have easy facility for the economical and expeditious transportation of stock and product, with easy drainage, and a breeze which never fails to make the location at once more healthy and much cooler than those commonly selected as sites for furnaces and mills. The summer heat is long continued and oppressive at St. Louis, but owing to the peculiar advantages of the situation, it is probable that the new Bessemer works at this point will be the coolest and best ventilated in the country. The works have a frontage of 1200 feet on the river, with the necessary shipping facilities, and run back 1800 feet, covering an area of 20 acres. The St. Louis and Iron Mountain and Atlantic and Pacific Railways pass through their property, also transfer railroad to East St. Louis, connecting their works with all Eastern and Northern railroads.

The plant of the company is extensive and excellent throughout. Of blast furnaces there are three, all large. Nos. 1 and 2 are 62 feet high by 15 feet bosh, with closed top; and No. 3, comparatively new, 65 feet high and 16 feet bosh, is considered a model furnace, and will, no doubt, justify all reasonable expectations. These furnaces have a capacity of 160 tons of 2208 lbs. Bessemer pig per day. The casting house for Nos. 1 and 2 is 90x100 feet; that for No. 3 is 110x50 feet. The stock house is 600 feet long, 130 feet deep and 60 feet high. Two branch tracks run into the stock house. Most of the coke is shipped direct from Pittsburgh by rail, to East St. Louis, and the new station opposite Carondelet, Pittsburgh Landing, and is brought to this shore in the same cars, either directly in stock house or on barges. The coke, by last route, is then put into small cars and pulled up by an engine. The big muddy coal is shipped from Grand Tower direct to the wharf of the works, by rail or river, and hauled in the same way. The limestone quarry is situated adjoining the works. There are steam elevators to all the furnace tops, and three large brick hot blasts, 64 pipes each, which are kept up to a temperature of from 800° to 900°. There are 18 steam boilers in batteries of three each; these boilers are heated by waste gas. The engine house is 80x60 feet and 60 feet high, and is a very solid, massive building. The blowing engine for these furnaces is one of Totten's (of Pittsburgh) largest. It is a vertical, low pressure, condensing engine of immense power, but runs with only 20 to 30 lbs. pressure. It is 47 feet high; blowing cylinders, 9x9 feet; steam cylinders, 60 inches by 9 feet. The two flywheels weigh over 30 tons each, and everything massive in proportion, and it is a model of mechanical skill. Also an upright blowing engine with steam cylinder 34"x60" in center, and air cylinders on each side 60"x60", the three cylinders being in line on one bed plate. There are large ore crushers driven by powerful engines; all the large pieces of ore are roasted before being crushed. The Vulcan Iron Works use only Iron Mountain ore and the red hematites of Southwest Missouri. Their coal is brought from Gartside's mine, and coke from Connellsville, Pa., by cars and barges direct.

The original plant of the company comprised two mills, substantially built of brick. The puddle mill, a solid one story building, containing two divisions, the top and bottom and the old rail mill, and the puddle mill proper. The size of the first mill is 470x90 feet. All the foundations of these works are on the rock which underlies their whole property.

The puddling mill contains 17 double and one single puddling furnace; the top and bottom mills six heating furnaces for making heads and bottoms for rails, and one furnace for breaking down old rails. These are driven by two vertical engines, of 250 horse power, through a set of 23 inches train. The rail mill has ten heating furnaces, driven by an engine with 23 inches train. There is a boiler over every furnace in all the mills. The steam goes through pipes into the main pipe, which passes all along the mill under the comb of the roof, whence it is connected by other pipes and flues with the engines. One engine drives the puddle train and another the top and bottom train. The production of this mill is 110 tons of flats in 24 hours. Two sets of Burden squeezers are used. Over the furnaces and machinery, in the puddle mill, are telegraph tracks, from which are suspended the tongs and hooks by which the iron is brought from the furnaces to different points, whenever needed.

West of the puddle mill, and separated by a yard 60 feet wide, is the rail mill, 200 feet long and 100 feet deep, with an L 125x100 feet. The coal is brought from the stock house or barges in dump cars, on overhead railroads, which pass all around the works, to the places where the fuel is wanted. In the entire mills they use the soft coal from Gartside's Big Muddy mines. The charging crane used in the rail mill is an improvement on any elsewhere used. A cast iron post is set upon a bracket, bolted to the furnace, which forms the stand, and there is a bracket at the top to support it. This pole holds an iron crane, on which are two pulleys connected with a wrought iron strap and swivel, the latter supporting a bar bent at the lower end. The upper end is held by the swivel, and the lower carries the pole. By this arrangement the iron can be put in proper place in the furnace with great ease, the crane sustaining the immense weight, while one hand suffices to direct its course.

The new Bessemer plant now approaching completion is building from plans furnished by Mr. A. L. Holley. The rail mill for steel rails is 400 feet by 100 feet, with engine of 40 inch stroke by 36 inches diameter of cylinder. There are — trains of rolls, with a capacity for turning out 200 tons of steel rails per day.

The converter building is 115 feet 6 inches by 84 feet 5 inches, and contains two 6-ton vessels. The cupola building is 79 feet long by 50 feet wide, and contains three cupolas for smelting pig and four cupolas for smelting spiegel. The other buildings are as follows: Engine house, 80 feet by 36 feet; machine shop, 80 feet by 40 feet; foundry, 90 feet by 50 feet; boiler house, 178 feet by 80 feet. All these buildings are of stone and brick, with iron roofs, and stand on stone foundations.

The converter machinery comprises the cupolas already mentioned, of which we have the following dimensions: those for Bessemer pig, 8 feet diameter by 40 feet high; four spiegel cupolas, 5 feet in diameter by 40 feet high; two 12-ton cupola ladles upon scales; two 6-ton converters, 6 feet clear in diameter by 15 feet high; twelve crane ladles, two single ovens and two double ovens.

The steam machinery comprises 27 boilers of the 4-flue pattern, 28 feet long by 44 inches diameter, constituting nine batteries; two blowing engines for the converters, 42 inch steam cylinders, 54 inch air cylinders and 48 inch stroke, each provided with two 20 ton flywheels. In addition, there is a Worthington duplex blowing engine for the cupolas, 18 inch steam cylinder, 60 inch air cylinder and 36 inch stroke; and an upright blowing mill engine, 40 inch cylinder by 36 inch stroke; two large size Worthington duplex pumps and three immense walking beam pumps.

The heating furnace plant comprises twelve gas producers and three gas furnaces, 20 feet by 8 feet beds for ingots, an 8 feet diameter tunnel for gas connects with the boilers, their fronts being constructed to use either gas or coal, or both.

An abundant water supply is secured by pumping from the Mississippi River into the company's reservoirs by six 8-inch suction Cameron and Niagara pumps. One of Wm. Sellers & Co.'s best 3-ton steam hammers is provided for cutting the ingots. All the machinery, with the exception of the steam hammer, is of St. Louis manufacture.

Work upon the Bessemer mill is now carried on night and day, and it is the intention of the company to have the works in operation by the last of March. The company will continue to make iron rails of 30 lbs. section and upward as heretofore, and have a capacity for 1800 tons per week in both rail mills.

The Vulcan Iron Works are owned and operated by a stock company, of which D. K. Ferguson is president, D. E. Garrison, vice-president and general manager, and O. L. Garrison, secretary. The general offices are at No. 221 Olive street, St. Louis.

#### Improved Pile for Iron Tubing and Nut Blanks.

The Cleveland Trade Review describes an invention of Mr. J. Ostrander for making nut blanks and iron tubing. It not only accomplishes the results aimed at, with a very material saving of labor, and an economy of production throughout, but turns out a product in every way superior to that obtained by the ordinary method now in use. Nuts manufactured from the blanks are stronger, in that the iron is made compact by rolling and toughened by annealing, and the finished nut is much stronger, as the process of punching, which cuts the fiber of the iron and necessarily weakens it in every part, is entirely done away with. We have inspected a tube some two feet long and one one-eighth inches in diameter, having a three-eighths inch hole, which was rolled in an eight inch mill at the Cayahoga Falls works of Israel Jones, with Mr. Ostrander's pile. This tube was rolled from a square pile, and had four welds. The

iron was poorly rolled, owing to defects in the mill, which had accumulated rust from having been long idle, but otherwise the tube was perfect, indicating no single point of defect or weakness. Mr. Ostrander's device provides for rolling and welding the skelps in two pieces, instead of four, which, of course, is a still further advantage. The tubing can be rolled to almost any required thickness requisite for hollow shafting or bolts, and can be formed into any desired shape for nuts, either square or hexagon, and sawed into nut blanks at the same heat.

#### Industrial Development of Japan.

Mr. Annesley's Consular report from Hiogo and Osaka, Japan, to the British government, is one of great interest. He does not limit himself to mere statistics, but endeavors, not without success, to point out their true significance. Thus, after showing that the general trade of the port of Hiogo exhibits a considerable increase for the year ending 1874, arising mainly from the increased export of tea, which exceeded that of the preceding year by 50 per cent. in quantity and was rather more than 100 per cent. in value, he finds in this excess little that is cheering. It is shown that the year has been "commercially unhealthy," and stocks have been so far disproportioned to the conditions of consumption that, in order to realize them, it became necessary to force them on a falling market at a ruinous loss, or in some cases to reship to Europe at presumably still greater disadvantage. Mr. Annesley calls attention to the increased consumption of light European fabrics, such as mousselines, a branch of trade which is entirely in the hands of the French and German manufacturers, as he supposes from the greater delicacy of the continental dyes, which the climate of England does not allow us to rival. Mr. Annesley points to the rapid development of native industrial undertakings in Osaka, and the information he gives on this subject would be full of interest and instruction, even if it had a less direct and important bearing on the development of our own commerce in Japan and the East generally. We agree with the *Japan Mail* that "it is pleasant to contrast the self-reliant pluck with which these baby factories are launched upon their sea of troubles, with the clamor for protection to 'infant industry' which the American statesman is assailed with, and which a prohibitory duty alone can appease. With a mere shadow of a protective tariff the Japanese manufacturer enters the lists with his foreign competitors, and shows no lack of courage or skill." A simple enumeration of the various branches of industry which this enterprising people has developed within the last few years will amply testify to the correctness of this judgment. Beside railroads, telegraphic lines, and mines, worked with European labor and machinery, a mint, now chiefly under the management of the Japanese themselves, and gasworks for lighting a town, Mr. Annesley refers in some detail to the following:

A paper manufactory capable of producing a ton of paper in a day; a sugar refinery estimated to refine four or five tons of Japanese sugar daily; a cotton spinning factory, by steam, newly imported from Europe, and in good working order; though as yet only producing coarse thread—No. 18 to 24 chiefly. Cotton yarn and cloth and cotton knitting are now bleached to perfection, after European fashion, by Japanese, and with great advantage. Dyeing yarn and raw cloth, Turkey red, in imitation of foreign patterns, has been tried, though as yet without perfect success. Knitting machines, we are told, are regularly bought up, and made use of considerably by the Japanese in the making of underclothing, shawls, scarfs and stockings in cotton and wool, all colors, and "the natives work them very cleverly." The most suitable of these knitting machines are two American patented inventions. Carpet weaving, a few years ago wholly unknown in Japan, has been introduced, and the Japanese are reported as making "some handsome specimens of carpeting of cotton and mixtures, of straw fibre and coir fibre, after European patterns, very solid and cheap." Manufactories of hats, cloth and straw, and of caps of cloth of every kind, of velvet and silk, after the foreign style, have been started in Osaka with great success, and the trade has become a very profitable one. Clothing of all descriptions after foreign patterns, as well as shoes, are made on a large scale, of excellent finish and at such moderate prices that foreign goods of this class are scarcely saleable; while the wearing of foreign clothes by the Japanese is steadily on the increase. Sewing-machines are in great use, and the Japanese tailors know well how to handle them; and the imported machines are now becoming very difficult to sell, because the Japanese themselves are making sewing-machines, "perhaps not exactly as perfect as foreign-made machines, but so much cheaper that most of the natives prefer to invest their money in the cheap imitation" rather than in a more solid or better imported article. They have also a glass manufactory, and they now make very fine glass ware of all descriptions, and, except window glass, at a much cheaper rate than they can be imported. Chemicals are being manufactured by the Japanese from imported drugs. Fire bricks of common quality, made of sand and clay of superior quality and better make than the celebrated "Schamot" bricks, are now manufactured in Osaka by a gentleman from Swansea on a new system and of better quality, it is said, than any as yet imported. This establishment, Mr. Annesley was informed, is prepared to make in one cast 20,000 bricks, one laborer making 1000 in a day. Revolvers and guns are made in Osaka and Sakai after foreign patterns, "cheap and tolerably well finished."

Finally, bread, beer (an imitation of German light beer), liquors and confectionery are produced in Osaka; soda water, lemonade, and other aerated waters also; and they have even tried their hands at cigars, though in this new industry they have not yet been quite so successful as in nearly all the others enumerated in this long list. When we consider that all these efforts are the fruit of the last few years, less than a decade, indeed, it is impossible not to see in such industrial development a sure presage of further advance, and the approach of a time, not far distant, when, although the Japanese have almost denationalized themselves by the adoption of all things foreign and the creation of a whole circle of new wants, they will be quite able to supply them all from the work of their own looms and shops, and leave a very small margin for the foreign importer in a market which he fondly hoped would, with its thirty millions of inhabitants, afford him a permanently profitable field.

#### Old Vessels.

The *Standard*, of New Bedford, Mass., says: It is now understood that the bark *Draco*, of this port, is not the oldest vessel in the United States, as was claimed, but we still hold that the oldest vessel belongs at this port. Bark *Rousseau*, owned by George and Matthew Howland since 1835, was built by Stephen Girard, at Philadelphia, in the year 1801. She was employed in the merchant service from Philadelphia, by Mr. Girard, and after his death was purchased of his estate by George Howland. Her old measurement was 305 tons, and the new measurement differs only a fraction of a ton. She was newly topped in 1845, but run on her original bottom until 1870, when she was newly planked, and was supplied with some new timbers, the old ones being found in a remarkable state of preservation. She now has her original keel, and all her original deck timbers, with one exception. For the first few years after her purchase by her present owner, she was employed in the merchant service, but for many years has been in the whaling business, and has never lain in port except to refit.

Bark *George and Susan*, belonging to the same owners, was built at the head of Apponaugset River, in 1809, by John Wood, for George Howland, father of her present agents. When built she registered 387 tons. In the fall of 1839 she was hauled up, cut in two, and lengthened 16 feet, making her tonnage 356 tons. She was in the merchant service, and made several remarkably short passages. When returning from a voyage to Europe at one time, the *George and Susan* passed a ship bound to Archangel. The *G. and S.* came into port, discharged cargo, reloaded and sailed for Archangel, passing the same ship, and arriving at that port ahead of her. The captain of the ship that had been so badly beaten would not believe that the *George and Susan* had been in port, until he was shown her papers.

Bark *Java*, built in Newburyport, in 1822, was bought by George and Matthew Howland, her present owners, seven years after, and is now employed in the whale fishery.

There are belonging at this port 23 other vessels, fifty or more years old, viz: *Cicero*, built at Mattapoisett, in 1823; *Coral*, at Newbury, in 1819; *Desdemona*, in Duxbury, in 1824; *Falcon*, at Medford, in 1817; *Heracles*, at New York, in 1816; *Java 2nd*, at Medford, in 1818; *Mercury*, at Mattapoisett, in 1822; *Milton*, at Milton, in 1815; *Mars*, at Newbury, in 1823; *Midas*, at this port, in 1810; *Mt. Walleston*, at Quincy, in 1823; *Ocean*, at Haddam, Ct., in 1822; *Pacific*, at New York, in 1807; *Pioneer*, at Scituate, in 1824; *Pern*, at Hanover, in 1818; *Seine*, at Saybrook, in 1815; *Spartan*, at Mattapoisett, in 1821; *Sarah*, at Mattapoisett, 1824; *Triton*, at Fairhaven, in 1818; *Tamerlane*, at Wiscasset, in 1824; *Young Phoenix*, at Mattapoisett, in 1822.

Notwithstanding their age, all of these vessels are now in active service and good condition, and some of them are as fine models as many of more modern build.

A recent railway collision in England resulted from a curious and most unexpected cause. The 10 o'clock freight train from Wimbledon arrived at West Croydon shortly before 12 o'clock, having been considerably delayed by the weather, and was left standing below the station while some passenger trains were being switched, when the 12 o'clock passenger train from Victoria, which goes round by Wimbledon, arrived at Waddon Marsh, where there is a signal station. The line is worked on the block system, and as the electric indicator showed that the line further on was blocked, the train was stopped, and the driver waited the signal from West Croydon to go on. The train had remained stationary about five minutes, when, directly after a vivid flash of lightning, the arm of the indicator dropped and the bell inside the signal box rang, as is usual when an electric message is received. The line being thus signalled "clear," as was believed from West Croydon, the signalman ordered the driver to go on, which he did; but on rounding a curve a short distance on, he perceived the freight train on the line directly in front of him. He endeavored to stop the train, but was unsuccessful, and the fore part of the passenger train ran into the rear of the freight train. Fortunately, however, the damage occasioned was but slight. The guard of the passenger train received a few contusions, but no bones were broken. The brake van of freight train was slightly injured, but the passenger train sustained little or no damage by the collision. It has been ascertained, it is said, beyond doubt that the accident was entirely due to the action of the lightning on the signaling apparatus.

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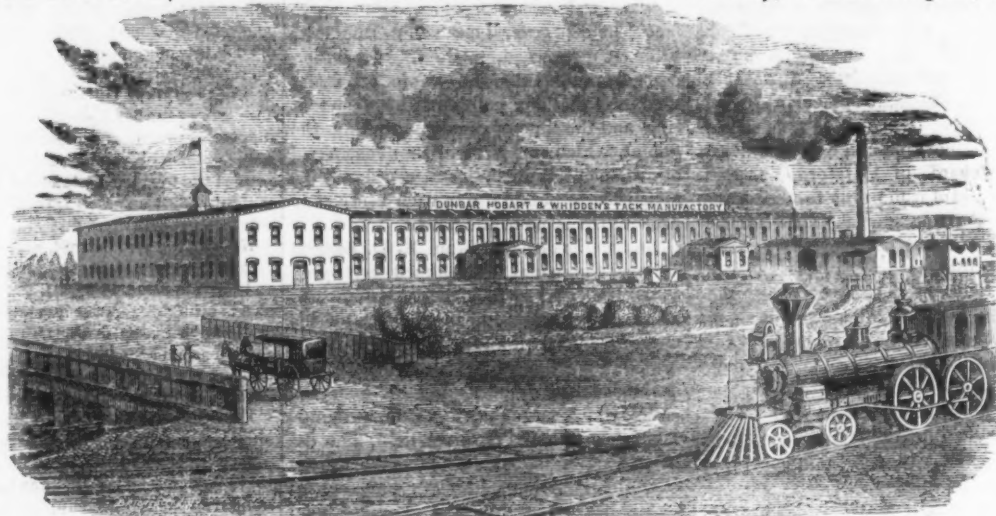
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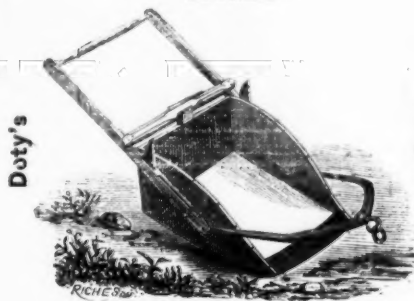
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## The Intercolonial Railroad.

The Intercolonial Railroad, connecting Halifax and St. John with the Canadian railway system at Riviere du Loup, has been formally opened, having been completed with the exception of a very short section where grading and track laying are still in progress, and another where the gauge has yet to be changed from 5 feet 6 inches to 4 feet 8 1/2 inches. The road is some 600 miles in length, and is considered to be one of the finest on the continent. There are over 2300 miles of Bessemer steel rails, weighing 70 pounds to the yard, all the bridges of more than 24 feet span are of iron, the masonry everywhere is most massive, the curves are easy—there are some sections twenty and thirty miles long where the track is a dead straight line—the grades are not as a rule difficult, and there has been no sparing of expense in such details as rock cutting or the filling in of streams and swamps whose waters have been diverted by dams and drains into new channels through elaborate tunnels. The line has been built by the government at a very heavy expense. England guarantees the interest on debentures, maturing in from ten to forty years, to the amount of \$15,000,000; the Dominion has appropriated the rest of the money. The principal credit for securing the adoption of the plans is due to the late Hon. Joseph Howe; in the work of construction the chief engineer (whose exhaustive survey report of 1864-5 was a document memorable for its fullness and impartiality), Mr. Sandford Fleming and Mr. C. J. Bridges, one of the Commissioners and probably the most accomplished railroad manager on the Continent, have been conspicuously active. The history of the road is most interesting, though in detail too long and too much involved to be acceptable to American readers. The originator of the idea of such a railroad to promote Canadian unity was Earl Dunham, who in his famous "Report on the Condition of Canada," made in 1839, urged its construction, and predicted as well the ultimate federal union of the colonies. Agitated in 1845, despite the coldness of Earl Grey, the scheme was near realization six years later, when political complications and a private intrigue killed it. Trent troubles, when England was compelled to march her reinforcements through the woods to Riviere du Loup, awakened the imperial authorities to the necessity of providing some channel of communication during the winter months between the seaboard and inland, and early in 1862 the Duke of Newcastle announced the willingness of the British government to guarantee a loan for the building of the road. Thenceforward, though delayed for five or six years by political complications, its construction was certain. The road will be operated by the Dominion government at, it is safe to say, a considerable loss for a generation to come. It should hardly be judged by such canons of criticism as apply to ordinary railway enterprises. It was built

primarily because it was a military and political necessity. Without it England would, in the event of a war, have been cut off from Canada at the very season when the conquest of Canada by an American army (so, at least, Generals McClellan and Lee are stated to have agreed in believing) would be most facile; without it the maritime provinces would never have entered the Dominion. Though the country which the intercolonial traverses is everywhere fit for cultivation and possesses coal measures and an abundance of timber, though it opens up many prosperous and well populated communities that have hitherto been isolated from the world without during one half of the year, though it will certainly promote immigration, though it will as certainly prove an attractive route for summer travel, and though the through traffic between Montreal and the maritime provinces is steadily and rapidly increasing, the road must, for many years, be operated at a heavy loss, especially as to keep it open in the severe winter season of that latitude is no easy nor inexpensive task. For all this, the Intercolonial must ultimately prove a paying investment, and the possibilities of winter navigation of the Gulf of St. Lawrence, of a rail route to the Eastern extremity of Newfoundland, or of an important trans-continental link by way of the Canada Pacific Railroad in the high latitude route from Europe to China and Japan, will, at some future date, combine to give it an importance that may, at present, be denied to it by the superficial observer.

**The Oboukowsky Steel Works, Russia.**—As much attention is now being given to Russian trade and productions, it will interest our readers to know that these famous works, which are often referred to in metal reports, are the property of the Russian government; they are situated near the town of Alexandrowsky, and have their name from that of their first manager, Oboukoff. Steel only is made there, principally for rails and ship guns. The steel is crucible cast, a mixture of crude iron, bar iron, and magnetic ore. The crude iron is charcoal-made, and comes from the Ural, whence also comes the ore, which contains 75 per cent. of metal; the bar iron is Siberian. The crucibles used contain 37 kilos. of melted steel each, weighing themselves 15 kilos. each; they are made of a mixture of 10 kilos. of fire-clay, 2 1/2 kilos. of ordinary clay, half a kilo. of charcoal powder, and 2 kilos. of graphite. Blocks of steel are made up to 40 tons, the quantity necessary for the manufacture of a marine 12-inch gun. Three hundred crucibles are prepared for a running of 10 tons, and the casting takes about ten minutes; the manipulations are executed with great precautions and with almost military precision. All the crucibles are the same, so that a piece of 40 tons, for example, takes 1300 crucibles. The casting is reheated and welded by a 50-ton hammer, which forges them into the desired shape. A provisional

boring, is then effected. The tubes thus got are annealed and then tempered in cold oil; they are placed last of all in an annealing furnace from which the fire has been withdrawn, and here they are left until the cooling is complete. The figures which serve as bases for the measurements of resistance and elasticity are inferior to those used in England, but it is well known that Russian steel is far inferior to English.

## Ships by Rail.

Under the original design and in early practice the ship was purely a means of transportation, and was constructed to carry the goods of one country to another. Gradually it became an article of manufacture and sale, and the British provinces build for English owners, and English yards have filled Turkish and Egyptian, and are filling German and other orders for ships of all kinds and sizes and character, as methodically as the cotton mills fill orders for cloth.

It has been reserved for this country to advance a step in this direction, and to employ 2000 miles of rail for the conveyance of ships. This is a consequence of the substitution of iron for wood in marine architecture; that allows the knees and beams and plates and masts of the ship to be packed like its engines, and conveniently and expeditiously handled. Within a few days some thirty cars were loaded here with the various portions of a ship—and as many more are being loaded in the same way—that, crossing a continent, will be erected in San Francisco, there launched and registered and owned and loaded. A month will suffice to place the whole where it is to be framed; and with a little expedition the San Francisco ship, full freighted, may pass any vessel dispatched by sea hence for that port, at Cape Horn.

The precedent is likely to grow and may have important results. It enables any navigable waters to obtain the tonnage they cannot construct as readily as the usual manufacturers, and not only tonnage, but the best. For the construction of iron ships, more difficult than wooden and calling for extensive works and machinery and more and more skilled labor, cannot be prosecuted as former ship building was. The iron, the coal, the furnaces, the labor, the machinery, the knowledge, the money must be concentrated, as is the case on the Scotch and English coasts. The concentration and employment of these speedily enables them to reduce the cost to its lowest sum, and the character of their product, as just shown, allows it to be transported wherever railways run.

The great difficulty in iron ship building is the cost of the plant and the difficulty of procuring enough skilled labor at all times. These difficulties have been surmounted on the Delaware. Here are the yards, all equipped and ready to turn out anything from a yacht to a

ship-of-the-line. Every ship built adds to their facilities, that were unvalued in the beginning; and so soon as the plant has been paid for, the ship can be furnished at no other rate than is required for cloth or saws, locomotives or rails. There are a hundred ports to profit from the fact. They may order by sea or rail, on 90 days or C. O. D., and be assured that the goods they receive are equal to the best.—North American.

**Steel Castings.**—The use of steel castings for agricultural purposes, machinery, wagon axles and boxes, &c., is rapidly increasing. Pittsburgh seems to have taken the lead in bringing this branch of the steel trade to a successful issue. Many tons a week of plow points alone are said to be turned out in Pittsburgh. There is also a large call for steel wagon boxes and axles, gearing, pinions, &c.; while a great variety of castings to take the place of expensive forgings keep up with the capacity of different establishments now successfully in the business. One great advantage of the annealed castings is that they can be drawn under the hammer or cut with shears the same as rolled or hammered steel. This is especially a valuable feature in agricultural steels.

## European Coal Oils.


Many and widespread are the localities where this nutriment of our lamps and of divers singular industries is more or less freely yielded, as it were, from the many breasts which the old sculptor gave to the goddess Nature. In Great Britain the mighty mother renders it, in a few localities, in the form of bituminous shales; grudgingly, so to speak, and in small amount. Yet the recipients, thankful for the gift and using it well, have thereby originated the value to manufactures and commerce of all the petroleum of the world. The canal coal of Lancashire, due to the predominance of cellular over cellulose-vascular and hard-fibred old world plants, and the transition of such compact non-laminated coal to bitumen when the traces of the water-breathing vegetation exclusively appear, have enabled the paleontologist to throw light on the mysterious genesis of "rock oil." In the department of Saône-et-Loire at Mirey and Milery, French industry has followed the Scotch example in procedures for the extraction of petroleum and paraffin from the bituminous shales of France. And one is not surprised to learn that frogs disported themselves in the marshes where grew the primeval vegetation which has been metamorphosed into naphtha. In Austria, the Gallician "coal oil" region has given to some before poorly provided land owning nobles a princely return. Alsace and Hanover begin to draw small supplies from anticlinal oil beds in tertiary deposits. The petroleum of the Caucasus claims precedence in historical record. It was obtained by the skimming of surface wells, chiefly on the shores of the Caspian Sea. It is most abundant

or most obvious and superficial, in the vicinity of the noble harbor of Baku, and it only needs the utilization of that port by adequate shipping and commercial enterprise to make the naphtha of the Caspian a highly remunerative export. There the modern traveler is attracted by the fire worshiper, still lingering in the ancient Persian locality, who sets alight the flaring jet of natural oil gas, and so performs the outward and visible sign of his superstition. Then the stranger pushes out to sea by night to gratify his wondering curiosity by witnessing the fitful illumination of the town and harbor through a wasteful conflagration of the hydro-carbonic wealth with which nature has stored the subsoil of this part of the Russian Empire.—Fraser's Magazine.

We are informed that the Cumberland Valley Railroad is about having constructed a number of passenger cars in which seats will be numbered, and overhead there will be a receptacle provided with lock and key for the baggage of the seat holder. The excursionist buys a ticket, and with it he receives a key and a check attached, and on the check he finds a number stamped corresponding with the number of the seat to which he is entitled. He will find the key to unlock the closet over his seat, but not the closet over any other seat. When he reaches Philadelphia he can lock up as much of his baggage as he chooses and safely forth. The train will be run upon a siding convenient to the Centennial grounds. At any time the excursionist desires he can walk over to the train, unlock his closet and take out or put in anything he chooses. He may even put his lunch there. At night, on the way home, the check and key are taken up with the return ticket. The passenger is thus put at no inconvenience, but, on the other hand, is supplied with accommodation almost unknown to railway travellers at the present time.

The Ohio State Journal of the 3d, says the coal operators of the Hocking and Straitville Valleys held a conference in Columbus on the evening of the 2d, to arrive at some understanding with reference to the coal trade, and after looking the field over, and discussing it, they determined that in the present state of the trade the price of coal cannot be raised. Markets which were lost during the long interruptions of the last year or two have been just fairly recovered, and, under such circumstances, it is not proposed to go into any derangement of prices. The miners in both valleys are now receiving 50 cents per ton for mining. One of the operators in the Hocking Valley was recently approached by a committee of miners, on the subject of raising the price of mining to 60 cents, the new rate to go into effect on the 1st of November, but in order to give three days notice the time was extended to the 3d of November. The answer was that no time was required for consideration, as the present state of the market would not justify an advance.





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**Lewis Patent**  
Single Twist Solid  
**SPUR BITS,**  
Mechanics' Double  
Twist Auger Bits,  
Machine Bits,  
both Single and Double  
Twist.  
Patent Countersunk Bits,  
Double Cut  
Gimlet Bits,  
Metal Head Gimlets,  
**REAMERS,**  
Screw Driver Bits, &c.

The Lewis Pat. Bits are superior to any others in the market. They are made of best cast steel and combine the advantages of Jennings Bits, Cook's Bits and the Ship Augers. Send for price lists and discounts.

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At 95 Chambers St.,  
**BETTS & BURGER.**  
Large Lot of Iron Handled Stove Shovels,  
at \$6.00 per gross.

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Manufacturers of  
**Chemical & Physical Instruments,**  
191 Greenwich Street, N. Y.  
SPECIALTY—BUNSEN'S GAS BURNERS, for all heating purposes; BUNSEN'S IMPROVED GAS COMBUSTION FURNACES, with 10, 15 and 25 burners. Fine Brass and Metal Work made to order for Metallurgists, Chemists, Experimenters, Colleges, &c.

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To dealers in Blacksmiths, Coachmakers and Machinery Supplies generally: Send for descriptive circular, &c., of the improved  
"Eclipse" Fan Blower.  
The best and cheapest in the market; price only \$20, and guaranteed. Discounts liberal. Also, TIRE HENDERS, DRILLING MACHINES, STEAM ENGINES, BOILERS, &c.  
**EDWARD F. LANDIS,** Lancaster, Pa.

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### SAMUEL A. GODDARD & CO.,

Commission Merchants and General Agents,  
execute orders for British manufacturers on the lowest terms, and collect and forward goods for a very moderate payment. Agents for the sale of North Staffordshire Iron of a standard quality.

### FAIRBANKS' SCALES,

R. R. TRACK, HAY, COAL SCALES



### SCALES

For Rolling Mills, Furnaces, Foundries,  
—Miners' Use.

### SCALES

For Stores, Mills and Wharfs.

### SCALES

For Elevators and Grain Warehouses.

### SCALES

For Farmers, Butchers, Druggists, &c., &c.

ALSO,  
The Most Perfect Alarm Cash Drawer,  
MILES ALARM TILL CO.'S. Also,  
Herring's Scales, Coffee and Drug Mills, Letter Presses.

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MANUFACTURED BY:

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For sale by leading Hardware Dealers.

## LEIGHTON BRIDGE AND IRON WORKS,

Rochester, N. Y.

Wrought Iron Riveted

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AND

HIGHWAY BRIDGES.

Wrought Iron

WATER PIPE,

The most economical and durable Pipe manufactured for Water Works, Oil Lines or Gas Mains.

General Riveted Work

Orders solicited from Civil Engineers and Contractors.

[Accompanying engraving represents the Springfield Bridge, built by the Leighton Bridge and Iron Works.]

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Established 1843. Manufacturers of FIRST QUALITY

# SPRINGS & AXLES

And Beer's Patent Curtain Rollers, Concealed Hinges, Etc., Springs of any pattern made to order. Send for Circular and Price List.

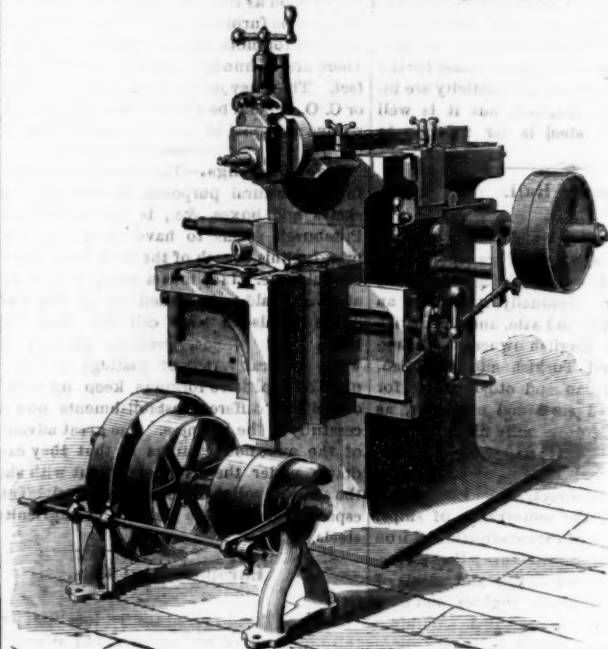
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Patent Planers and Shaping Machines.

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SPECIAL MACHINERY, of every description, made to order.  
PIANO and ORGAN WIRE WORK, VALVE and KEY PINS,  
Iron and Brass Wire, Finishing Nails, &c.

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### "Zero" Stove Cover Lifter.

Patented July 27th, 1875.

Made in one piece from a superior quality of sheet iron, with a perforated cylindrical handle. Its superior advantage over any other style of cover lifter are manifest, as it will not break or bend, keeps always cool, and will fit any stove cover made. Send for Circular.

### EAST RIVER SHEET METAL MFG. CO.

SOLE MANUFACTURERS, 253 Pearl Street, New York.

### HAMMER & CO.,

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Manufacturers of the following Patented Articles of

### MALLEABLE IRON:

Hammer's Adjustable Clamps.

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For Sale by all the principal Hardware Dealers.

Malleable Iron Castings

Of Superior Quality made to order.



## THE SWIFT MILL.

ESTABLISHED 1845.

The annexed cut shows one of the many styles of Coffee Mills of our manufacture, especially adapted to Grocers' use and all retailers of coffee. They are highly ornamental, and workmanship of the very best. Silver Medal awarded at the Great Fair of American Institute last autumn. We make more than 30 styles.

ALSO  
**Lane's Portable Coffee Roaster**  
Will roast 30 to 40 lbs. at once, and can be used as a stove at other times.  
Send for descriptive list.

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Also sold by leading wholesale houses.



No. 16.

## Ausable Horse Nail Co.,

MANUFACTURERS OF

### HAMMERED,

Hammer Pointed, Polished & Blued

### HORSE NAILS,

FROM

**BENZON IRON.**

Orders promptly filled at lowest market rates.

**ABRAHAM BUSSING, Secretary,**

35 Chambers Street, New York.



## STEEL TOE CALKS.

MANUFACTURED FOR

### ABRAHAM BUSSING,

35 Chambers St., New York,

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### SWEETS MFG. CO.

Warranted to weld and to harden, and to be equal, if not superior, to any made.



## GLOBE NAIL COMPANY,

MANUFACTURERS OF

### Pointed, Polished & Finished Horse Shoe Nails.

Recommended by over 20,000 Horse Shoers.

All nails made from best NORWAY IRON, and warranted perfect and ready for driving. Orders filled promptly and at lowest rates by

**GLOBE NAIL CO., Boston, Mass.**



## BUSINESS ITEMS.

## NEW YORK.

The Eagle Mowing and Reaping Co., Albany, have received an order for one of their improved mowers from Prince Henry of Luxembourg, brother of the King of Holland. The company have also received two gold medals for the best mower and reaper shown at the Luxembourg Exhibition in September last.

The Brooks Locomotive Works, at Dunkirk, have an order for eight locomotives for the Erie Road, which are expected to keep the shop busy until the 1st of April next.

## NEW JERSEY.

Two hundred tons of sugar manufacturing machinery have been completed by the Danforth Locomotive Works, of Paterson, for a Southern plantation.

The Bonton Iron Works are in operation, including the nail mills, and the town is ready to donate land to any one who will use it for manufacturing purposes.

The Wilson Iron Company manufacture blooms direct from the ore by a patent process in Split Rock township, Morris county. They have four Catalan forge fires and one puddling or baling furnace, all operated on the Wilson process. The quality of the iron, so far as tested, is fully equal to charcoal run out blooms for flanging plates. They expect to erect larger works next spring, and are negotiating for the erection of others in the Southwest.

## PENNSYLVANIA.

The Conshohocken, Sheet, Bar and Flue Mills will resume operations this week. The puddlers are still undecided what to do.

Messrs. A. Bradley & Co. and John B. Herron & Co., of Pittsburgh, stove manufacturers, have recently made arrangements for the manufacture of the inodorous and steamless stove furniture. Messrs. Weare, Bros. & Co., of Cincinnati, Ohio, have invented an article which prevents the steam or smell of any article being cooked from getting into the room. The ware is constructed in such a way that a vacuum is created between the surface of the boiling water and the lid, and there being a draft passage from the top, down the side of the vessel opening into the fire chamber of the stove, the steam and odor are necessarily drawn down this passage and sent out through the stove pipe.

About thirty hands are employed at the Huntingdon Car Works, and they are now busy on repair work on oil gondolas. Improvements are also being made to the building with a view of increasing the force of laborers. As soon as the enlargement to the present structure is made, a number of additional hands will be employed.

William B. Scaife & Sons, of Pittsburgh, have the contract for putting the roof (corrugated iron) on the converting and the cupola houses of the Bessemer Steel Works of the Vulcan Iron Company at St. Louis, Mo.

The new sheet mill and Neshannock furnace, owned by Bradley, Reis & Co., New Castle, are in full operation, and from present indications are likely to continue so through the coming winter. At present the hands employed in the mill number 120, and those at the furnace about 40.

The Beaver Falls Cutlery Works are sending to Canada cutlery made from American steel. A mammoth piece of hoop iron, measuring over 120 feet long and 8 inches wide, number 8 gauge in thickness, was rolled in the Lewis, Oliver & Phillips Mill, Pittsburgh, the other day, for the Exposition.

The Chesapeake Nail Works, at Harrisburg, have passed solely into the hands of Mr. Charles H. Bailey, of Harrisburg, and Mr. A. Wilhelm, of Cornwall. The works are very extensive and are doing a heavy business, notwithstanding the panic.

Last week seven new nail machines were put in the Etna Iron Works, New Castle, and five more will soon be added.

The Thomas Iron Company, of Hokendauqua, have elected the following directors for the coming year: Benjamin G. Clark, John T. Knight, William W. Marsh, Daniel Runkle, Charles Stewart, David Thomas and Samuel Thomas.

Atkins Brothers, of Pottsville, have recently sold 450 tons of rails for a new street railway in Washington City.

The steel mill of the Bethlehem Iron Company is now making rails for a city passenger railway.

The new furnace Alice, of the Etna Iron Works, at Ironton, is now making from 50 to 60 tons of iron per day, and working satisfactorily.

A reduction of 7 1/2 per cent. in wages is announced in all the departments of the Phoenix Iron Works. Production is very slow, and there is little prospect for steady work for the employees at the reduction.

The Pennsylvania Tack Works, Norristown, have recently made great improvements in their facilities for tanning, and are now using only government banded tin, putting on a heavy coat and thereby insuring their goods against rust in any exposed position. They are devoting much time and attention to their trade in upholsterers' goods. They began the manufacture of oval head carpet tacks about eight years ago. Their finishing nails are made from the best charcoal refined iron, from one inch up, the smaller sizes being of Sweden iron. The company make every variety of nails and tacks, and are doing a heavy business this season.

From Reading we have the following: The iron business is gradually reviving. Within a few weeks there has been a brisker demand for ore from the mining districts. One of the largest operators in iron ore at Alburts shipped last week ten cars of lump ore to the Pottsville Iron Company, and he has orders also to forward a certain quantity of the ordinary quality. The Philadelphia and Reading Coal and Iron Company are at present shipping 125

tons per day to the different furnaces they are now engaged in operating on shares with their owners. The revival in the iron trade, although slow is already making itself felt among the iron men and mine operators, and it is confidently hoped that the revival may soon become general throughout Eastern Pennsylvania.

There were turned out at the Paxton Rolling Mill, Harrisburg, the other day, two sheets weighing 4500 pounds each.

Charles H. Armstrong & Son are building 30 coke ovens on the line of the Southwestern Pennsylvania Railroad, and 150 at Armstrong Station on the Connellsville Railroad.

The ore belonging to the Fanny Furnace, in West Middlesex, is being shipped to the Red Jacket Furnace, in New Castle, which does not look much like anything being done in Middlesex this winter.

Under the arrangement recently made with the proprietors of furnaces along the Philadelphia and Reading Railroad large shipments of iron ore are daily made from the hills of Cumberland county, owned by the Philadelphia and Reading Iron and Coal Company. The Reading Railroad Company furnishes the furnaces with the ore and other material necessary to keep them in operation on easy terms. Hundreds of cars laden with ore are transferred weekly from the Cumberland Valley to the Philadelphia and Reading Railroads. The shipments from the mines have never been so heavy before.

The new sheet mill and Neshannock furnace, owned by Bradley, Reis & Co., New Castle, are in full operation, and from present indications are likely to continue so through the coming winter. At present the hands employed in the mill number about 120, and those at the furnace 40. During the week ending Saturday last this furnace produced 319 tons of Bessemer iron, all of which was No. 1, except 60 tons, which were No. 2.

The large shaft of the Warwick Iron Company, at Boyertown, which is being sunk to the depth of 376 feet, by the Diamond Drill Company, has been nearly completed. It is now within four feet of the required depth. Ore of good quality is now being brought to the surface. We were shown a specimen of that taken out within a day or two, that was very rich in quality. It would yield from 40 to 50 per cent. at least.

The proprietors of the Milton Nail Works, in Northumberland county, are now running the rolling mill connected with their establishment, getting out iron to be used in the manufacture of nail plates.

D. H. Schall & Co., of Lehigh county, have reopened the iron ore mines on the property of Dr. George Thomas, in West Whiteland township, Chester county. A large force of men is employed.

The total shipments over the Tyrone division, Pennsylvania Railroad, from January 1st to October 30th, were 749,241 tons, against 557,303 tons in 1874; increase 203,118 tons.

The stockholders of the Pennsylvania Graphite Company, who have recently opened a plum-bago mine at Byer's Station, on the Pickering Valley Railroad, and erected works at that place to prepare it for market, were there last week to witness a trial of the machinery. The establishment will soon be put in full operation, and will give employment to quite a number of hands. The black lead taken from their mines has been tested in the foundry, at Spring City, and was found to be of very satisfactory quality.

The Saltsburg Press learns that there is a possibility that the iron firm of Rogers & Burchfield, who recently suspended operations, may resume again within the next 30 days.

Arrangements have been made to start the Kutztown, Bucks county, furnace.

The miners at Fall Brook, Tioga county, are only working one and two days a week.

The Ormsby Furnace blew in last week under the new firm, and is doing a good business.

The Valley Furnace, at Sharon, is doing well, making in the neighborhood of 30 tons a day of good Bessemer iron, which is being shipped to Johnstown for use by the Cambria Iron Company as fast as made.

The Keel Ridge Furnace, at Sharon, is also making a good yield of good iron. This furnace is in the third year of her blast, and, to all appearances, is good for a few more years. The rolling mill connected with these works is going along steadily and working up to the average; in fact, these parties don't keep many things lying idle around them.

In West Middlesex the furnaces are being repaired, but there is no sign of the mill difficulties being settled. It is rumored that the Wheeler Iron Co. will take it and run it. If that is the case, there is some hope of its starting soon.

The Greenville Rolling Mill has commenced running double turn. The company intend to build three or four additional furnaces in their mill.

The new sheet mills in New Castle, now owned by Bradley, Reis & Co., is running a double turn in all departments. The firm recently filled an order from San Francisco.

The lining of the Valley Furnace, in Sharon, fell in again last week, which caused the furnace to blow out on last Saturday. The bell and hopper were saved. There is so much stock in the furnace that nothing can be seen, but it is supposed that the lining brick were of an inferior quality and shrunk somewhere about the bushes. The furnace made a good yield of good iron previous to the accident, and it is a pity that the thing happened just now. There is some talk of blowing in No. 2. We hope it may be true, as furnacemen find work scarce enough just now.—*Sharpsville Advertiser*, 3d inst.

The Pottstown Iron Company have completed the improvements to their furnace, and will "blow in" shortly. The cupola has been raised about 10 feet, a new hot air blast has been erected, and other improvements have been made which will render this one of the

finest furnaces in the Valley of the Schuylkill. The company shipped the other day 3000 kegs of nails, the larger portion destined for Galveston, Texas.

Union Furnace, in Union county, started up on last Wednesday.

Seven new nail machines were recently put in the Etna Iron Works, New Castle, and five more will soon be added.

The boilers in the New Castle Iron Mill, who have been on a strike for several weeks, returned to work on the 11th on the terms agreed upon between the manufacturers and puddlers of Pittsburgh.

The Palo Alto Mills, in Schuylkill county, after a year's idleness, resumed work recently with 300 men, at a reduction in wages of 25 per cent.

## MAINE.

The Evans Rifle Company, of Mechanic Falls, propose to manufacture still another style of magazine arm, one to carry the United States regulation cartridge of 70 grains powder, and 45-100 calibre, of which their patent magazine will carry 23 rounds, no other arm carrying more than seven of their ammunition.

Not long ago the Portland Press contained an extended account of the large 50-ton boiler, building by Quinn & Co. for the steamer John Brooks, of the Boston Steam Packet Co. The boiler is now completed, and is a fine piece of workmanship. It was removed to the Portland Company's wharf, where it was placed on board the steamer early this week. It was necessary to do this work on Sunday last, as it was the only time the railroad track was not in use. The removal was quite an undertaking, and required a large force of men. The boiler is the largest ever built in Maine, and for fine workmanship will compare with any ever built in the United States.

## MASSACHUSETTS.

The Putnam Machine Company, Fitchburg, are working 240 men 10 hours a day, and are sending their machinery to all parts of the country. Their foundry is running to its full capacity, so much so that it is hard to find time to do their own casting. Their facilities for manufacturing and shipping goods to any part of the country are unsurpassed.

The Peabody Machine Company, manufacturers and repairers of stationary engines, gearing, shafting, pulleys, &c., are manufacturing a tan press to dry the tan as it is taken from the vat, thus doing away with the tedious process of sun drying. They are manufacturing them at the rate of 1 a week at present, and are doing a general machine shop jobbing business.

## RHODE ISLAND.

At the Corliss Steam Engine Company's Works, Providence, recently, a casting was made of an anvil for the forging of the crank shaft for the two Centennial engines now being made at those works. The casting, when finished, will weigh twenty-five tons, but twenty-eight tons of the molten metal were poured into the mold. The shaft to be forged on this anvil will be nineteen inches in diameter, while sixteen inches in diameter is as large as they have made before. The engines which are to furnish the power for the machinery at the Centennial Exhibition will be of 700 horse-power each, and though the cylinders are not quite so large as that of the famous engine built by this company several years ago for the Wamsutta mills, in New Bedford, they will be heavier than that and capable of more power, and will of course bear the various improvements made since the first named was built—in short, the most powerful engines ever built for manufacturing purposes.

Carroll & Talcott, Woonsocket, employ 14 hands manufacturing steam, gas and water pipe and fittings, pumps, gauges, &c. They make a feature of running pipe, either in mills or houses, which is warranted to be done in a thorough manner, and they are doing some of the finest plumbing work in the State.

Among the manufacturing establishments that sentinel the banks of the Blackstone River, at Woonsocket, the American Twist Drill Company are one of the best known. This company commenced business in a limited way some nine years ago in East Blackstone, Mass. In the course of a few years the growth of business warranted their removal to a locality where it could expand with the progressive ideas of its founder, and in 1872 the establishment migrated to Woonsocket. Last year the present company was incorporated by the General Assembly of the State with a capital of \$100,000, the greater part of which has been paid up. They soon afterward commenced the manufacture of their Patent Diamond Solid Emery Wheel, which is used for the rapid grinding of edge tools, castings and all kinds of metals. The company are receiving liberal patronage from all sections of the country, their orders coming from workshops and mills in the New England, Middle, Southern and Western States. They are also shipping their goods to South America and Germany, and their export trade gives promise of assuming large proportions in the near future. Their sales now aggregate more than \$60,000 per year.

## CONNECTICUT.

The workmen of hollow ware in the Meriden Britannia Company's shop struck the other day, and the company yielded to their terms. Now the spoon brushers are trying their hand at the same game, on account of a reduction of wages.

The Secor Sewing Machine Company, of Bridgeport, lately involved in financial embarrassment, have procured an extension of time from their creditors, and will resume operations in about two weeks. Additional subscriptions of \$60,000 to the stock have been obtained, and also helps to relieve the company from their temporary financial embarrassment.

C. B. Rogers & Co., Norwich, have for 23 years manufactured all kinds of wood-working

machinery. The present organization was made in 1861, with Lyman Gould as president, R. M. Ladd as treasurer, and B. H. Rogers as secretary. Their buildings are 4 stories, brick, close to the Providence and Worcester Railway and the river. The main shop is 125x40, with wings 40x50 and 24x65. Their power is from 3 double 80 horse-power engines, which they built themselves. They employ usually 175 hands, and are just now busy on foreign orders, shipping planers, molding machines and saws to Sweden, South America, Germany and Australia. They have a show room in New York at 109 Liberty street.

J. P. Collins & Co., Norwich, Conn., water-wheel builders, moved into their new shop last month. The main building is worth looking into as a well arranged factory, 60x110, 20 feet stud. A crane on traveling trucks, a special device of their own, swings the heaviest castings into any desired point, the interior being wholly unobstructed by posts. Their pattern shop is 50 feet from the main building, and is three stories, 50x35 feet. Their storehouse is 25x200. Their power is a 30 horse-power engine. All their machinery is new and specially adapted to the making of the Jonval turbines. One tool, a turn table lathe, will work on a casting or forging 10 feet high and 13 feet wide.

The Norwich File Company employ eight hands cutting and recutting files. The business was started in August last.

A meeting of the creditors of the Woodruff Iron Works was held at the United States Hotel, in Hartford, last week, about 40 being present. The embarrassments of the concern grew out, it is said, of certain claims which were unsettled at the time of the death of Abijah Woodruff. Those who spoke expressed the heartiest sympathy for the Messrs. Woodruff, and desired that they should have every opportunity afforded to keep their works in operation, the stoppage of which might not only be injurious to their own interests, but also in no small degree to the city of Hartford. Letters of sympathy were also received from distant creditors proffering every indulgence. A committee was appointed, consisting of F. A. Pratt, president of the Pratt & Whitney Company, Hartford; Mr. Sawtelle, of Sawtelle & Judd, machinists, Hartford, and Mr. Emmons, of the firm of A. B. Warner & Co., New York, with full authority to examine the books, business, and state of affairs of the concern, and report at a future meeting. It is said that if the concern have relief on the old incumbrances, above alluded to, there will be no lack of means to continue the present business.

## WEST VIRGINIA.

A certificate of incorporation has been issued to the Bellevue Iron and Steel Works. The company will operate on the Hansford property, near St. Albans. It is formed for the purpose of smelting and manufacturing iron and steel rails, plate, sheet, bar, guide and hoop iron and steel, and the general ware pertaining to a smelting furnace and rolling mill; also, mining and shipping iron ore, coal and other minerals, to work in wood and to manufacture the same into cars, wagons and other implements and other uses of wood and iron; and also to sell, barter and exchange provisions, dry goods and groceries. The principal office is to be at Spring Hill, Kanawha county, and the capital \$100,000, with the privilege of increasing to \$500,000.

A correspondent, writing from Wheeling, under date of Nov. 1, gives the following interesting news in relation to the industries of that city: Business in this city is in statu quo, some of the mills claim to have orders on hand to keep them busy for some time, but they are, no doubt, shipping to agents in different sections; every boat takes from 2000 to 3000 kegs to river agents, which carries out the idea that not many legitimate orders are being received for consumption. The Benwood ("Old reliable") Furnace, at Martin's ferry, is out of blast, owing to a part of the lining burning out. It is being rapidly repaired and will be raised ten feet, it always having been too low; no other change will be made; it will not go into blast before Jan. 1st, 1876. Their mill at Benwood is being run full time as usual. The La Belle Works are making some additions to their works, the most important of which is the placing in position of 12 new nail machines, necessitated by their constantly increasing trade. In speaking of the Belmont it was recently stated that the nail and forge department was rebuilt; the facts are that the forge department only was rebuilt. They are running full time. The Top mill is running again, some orders having accumulated. Mr. C. D. Hubbard, the principal man of the company, is using his best exertion to have the P. W. & Ky. Railroad built. The road runs by their works, and if he succeeds in accomplishing his wishes it will be a great advantage to them; they will then finish the blast furnace, which was begun two or three years ago; without the railroad it is useless to a certain extent. It would be a grand thing, the completion of this road, for this city, and Mr. H. is confident that it will be built the coming year. The Wheeling Hinge Co. is running full time, with fair orders. The orders for Dunning's Patent Plate Hinge are coming in from all parts of this country and Canada quite freely, and there is no doubt but it is a grand success; the company have recently increased their facilities for making them; a full line of their goods will be on exhibition at the Centennial next year. The Riverside Works are running as usual and have no difficulty in disposing of their increased product, which is now between 6000 and 7000 kegs a week, which is a larger production than, perhaps, any other nail mill in the country to-day. The Whittaker Iron Works, "old Crescent," is running on sheet iron only. A. G. Robinson, Esq., who is largely interested in the Etna Iron Co. at Bridgeport, O., and has been interested in the manufacture of iron and rails for the last

30 years, talks of sinking a shaft, for the purpose of supplying his mill with gas; he sees in the near future that a mill without gas to manufacture with will be left behind in the race. The question of gas is an important one in this city, and I will post you on the result of Mr. Robinson's experiment.

## ALABAMA.

A number of furnaces in Alabama are being put out of blast.

## OHIO.

Most of the coal miners in Hocking Valley struck on the 4th for an increase of wages. They demanded 10 cents per ton in addition to the present rates.

A correspondent of the Cleveland *Trade Review*, writing from Ironton, says: "The new Etna Furnace is making 65 tons of No. 1 foundry iron every 24 hours, and the new Ironton furnaces owned by the Iron and Steel Company are making 45 tons of the same grade per day. Rolling mills and nail mills are running; times are brightening and stockholders are elated, many of whom are the operatives."

The Wilson Sewing Machine Company, W. G. Wilson, contemplate removing their works from Cleveland to Chicago early in the coming summer. They have purchased the large factory of the Cornell Watch Company, at South Chicago, and are converting it into a sewing machine factory, part of the machinery of which is being built in this city.

The Globe Iron Works, of Cleveland, are building 50 portable boilers for D. June & Co., manufacturers of agricultural implements, Fremont. They are also building two cupolas for the Wilson Sewing Machine Works, at Chicago, also a very handsome 10x20 hoisting engine for S. Brainard & Sons, Cleveland.

The Ironton Register says: Pinegrove Center, Vesuvius will not go into blast next year. It is undecided about Lawrence, Buckhorn and Howard, though it is probable that the two latter will run. Of course, the stone coal furnaces will run along more or less, as usual. They don't have to get ready six months before hand.

The Variety Iron Works, of Cleveland, are building four steel boilers 27 feet long by 44 inches in diameter, for the Clapp & Jones Manufacturing Company, Hudson, N. Y. These boilers are designed for the water works, being constructed by the above company, at Lafayette, Indiana. They are also building a 44 inch locomotive boiler, for Douglass, Freeman & Co., Warren, and another of 60 inch diameter, for Lord, Bowler & Co.

The Wrought Iron Fence Company, of Cleveland, turned out 25,000 feet of their elegant fences last season. They will continue to work full as late as December. They propose introducing additional machinery, and otherwise enlarging their works for the coming season. Their fences have been sold as far East as Hartford, Conn., and as far West as Denver, Col.

The derricks and hoisting apparatus, used by D. Haldeman & Co., in getting out the immense blocks of stone from their Amherst quarries, are from the works of Lord, Bowler & Co. A 15 ton block was taken out a few days since; the derricks has a 20 ton capacity.

The Hazard Hame Company's Works, Cleveland, were sold on last Friday by Mr. L. P. Brown, the assignee, for \$22,230 to Mr. Z. Hurd and others.

D. Price & Son, Cleveland, are about removing into their new works; they will occupy two floors, Nos. 59, 61 and 63 Center street, and are making very material additions to their saw machinery, and otherwise increasing their facilities for the production of every description of saws.

The Volcano Furnace, in Massillon, is again in blast.

The Sandusky Tool Company have just issued their new illustrated catalogue, the most complete they have ever before attempted. They manufacture a great variety of mechanic's edge tools.

Lord, Bowler & Co., Cleveland, are furnishing the entire outfit of machinery for the C. L. Morehouse & Co.'s wax and paraffine works.

The extensive reaper and mower works, of Amos Rank & Co., at Salem, are now being moved to Canton. The company has purchased the grounds and buildings of the old Canton Steam Engine Works.

The Cleveland Toilet Manufacturing Company are about to remove their works to the corner of Erie and Boliver streets. They have been established here about a year, and have located a large trade throughout the country. It is the only extensive establishment of the kind west of Rochester.

Messrs. Klotz & Kromer, proprietors of the Fulton Machine Works and Foundry, Sandusky, have entered suit against that city for \$10,000 damages. The suit grows out of a contract awarded to the firm, for the construction of the engines for the new water works, which contract was afterward withdrawn from them and awarded to Brooklyn parties, whose bid, we understand, was some \$2000 or \$3000 above that of Messrs. Klotz & Kromer.

The new water works at Sandusky are in course of construction. The contract for the pumping machine was let to Brooklyn parties for \$31,000. The iron pipe is being made in Poughkeepsie, New York and Columbus. John Carr and N. H. Moore, of Sandusky, have the contract for the stand and influent pipe, also for the engine house. The stand pipe is to be 132 feet high and 25 feet in diameter, and is said to be the largest in the country; the influent pipe is to be 170 feet in length by 3 feet in diameter. The total cost of the works is to be \$375,000, and are to be completed in July, 1876.

Both furnaces at Massillon are blowing.

Fulton Furnace, Jackson, has been blown out.

Business has never been so good with the Cleveland Screw and Tap Company, at Elyria, as now. Their works are crowded to their utmost capacity to meet the demands of customers.



The Connelleville Machine and Car Company is extending the capacity of its works, and is full of orders. The works are now employed on the iron works for two bridges over the Casselman River, on the ore cars and a passenger car for the Green Lick Narrow Gauge Road, and have orders beside for coal pit cars and shaft and furnace machinery.

Culbertson, Wiley & Co., Martin's Ferry, are furnishing the Benwood Iron Furnace with all the castings they need.

The Columbus Steam Pump Works manufacture a variety of pumps, and are now turning out a number of the Weinman patent.

The Cleveland Malleable Iron Works have recently built a considerable addition to their molding room and to their sales rooms. They are now building a commodious structure for their office, etc. The additions are all of brick.

The Lake Erie Iron Company are running full in their mill and one-half in the forge.

The Circleville Herald says: Between here and Columbus the Valley Road is ready for the rails. We understand that a party is at work near Chillicothe, and others on each side of Kingston, in all two hundred men. It will be quite possible to take New Year's dinner in Columbus via the Valley Road.

Ward, Mitchell & Co., proprietors of the Lagoda Agricultural Works, Springfield, are making large additions to their buildings, and will also add a new 200 horse-power engine.

The oil excitement at Grafton, Lorain county, continues unabated. One well on the Card farm has had at the rate of 300 barrels pumped from it in 24 hours.

At a meeting held at Newark, committees were appointed to solicit subscriptions of money to secure the location of the A. B. Chase organ manufactory at that place.

Bolton, Myers & Co.'s Steel Mills, Canton, are running day and night.

A stock company is being formed in Ashland, to purchase the shops of the Ashland Machine Company, and start the works up as early as possible.

Messrs. Murphy & Davis, at Alliance, have opened up a shop for the purpose of manufacturing terra cotta ware; the ground was broken for the building last week.

The addition to the new Enterprise Mill, Youngstown, is about complete, the engine is up and the foundations for the rolls laid.

#### WISCONSIN.

The Harris Manufacturing Company employ 150 men and manufacture about 4000 reapers and 4000 seeders annually. They have a cash capital of \$150,000 and a surplus of \$105,000. The officers are A. P. Lovejoy, president; J. H. Sheldon, secretary; L. S. Robinson, treasurer; S. C. Cobb, superintendent.

#### MISSOURI.

W. E. Moran & Bro., St. Louis, have the contract for the supply of all the bolt work for the new Vulcan Bessemer Steel Works at Carondelet.

Thirty thousand kegs of nails were sent from Wheeling to St. Louis recently.

The American Plate Glass Company, Crystal City, exhibited at the St. Louis fair a plate of polished glass 16x7 feet. This company has a capital of \$500,000, and its works contain 19 steam engines, 5 melting furnaces, 55 annealing kilns, 10 round grinders, 3 flat grinders; 36 smoothers, and 8 French polishers.

#### INDIANA.

The building of the Crawford Malleable Iron Works, at Indianapolis, west of the river, will soon be ready.

New steam boilers are being put in at the nail works at Terre Haute.

The attempt to bore an artesian well at Fort Wayne has resulted in a failure to discover water at a depth of 3000 feet. The work has been conducted at the public expense, but will now be abandoned, unless continued by private subscriptions.

#### Making Tea Trays at Newark, N. J.

Tea trays, stove boards, &c., have long been useful articles of domestic economy, but their manufacture was never successfully carried on in the United States until recently. Previously, tea trays had been imported from England, where they were made by slow processes, their comparative cheapness being secured by the application of low priced labor. The high finish which characterizes goods of this class comes from a peculiar japanning process. The glossy, mirror-like appearance of the Japan coating was the result, in the English tray, of an after process called polishing, the high lustre being obtained by "rubbing down"—a slow hand process. It was claimed by English manufacturers and the American importers that only the low priced, medium grades of trays could be produced in this country, and that articles of artistic design and high finish must be left for the British artisans to supply.

Mr. Walter M. Conger, of Newark, resolved to so improve manufacturing processes as to produce a more highly finished article than was made in England, and at the same time so cheapen the cost of production as to successfully compete with the low priced goods of British manufacture. He at once began experimenting, and the first important result was in the production of an improved Japan, only needed to be applied to the surface of a tea tray with a brush, and undergo a baking process at the required temperature, to produce a gloss and lustre far exceeding, both in finish and durability, the results of the slow and laborious hand polishing peculiar to English manufacturers. With this significant triumph as an initial point, during 1868 Mr. Conger began in Newark the manufacture of American tea trays—not, however, without many difficulties to contend against. He had greatly exhausted his finances, and more capital was required. He at this time secured the co-operation of Mr. John C. Johnson, a well known gentleman in the hardware trade of New York,

and a resident of Newark, who became a special partner in the business.

Following the perfection of the japanning process came the invention of machinery to take the place of manual labor. Although serious accidents intervened, the new industry flourished. In 1871 the Newark Tea Tray Company was organized. President and treasurer, John C. Johnson; secretary and manager, Walter M. Conger.

A primary difficulty against which Mr. Conger had to contend was to secure a fine quality of sheet iron for the trays. At that time English sheet iron was superior to the American article, yet the former was far more expensive, and at the same time not up to the desired quality and fineness. Resort was had to American rolling mills, and after repeated trials, Messrs. Rogers & Burchfield, iron manufacturers, of Pittsburgh, Pa., produced the quality necessary. The Pittsburgh firm mentioned is now making sheet iron superior to the best imported goods, the cost of production being far less, and they recently rolled the thinnest plate ever made.

The Tea Tray Company has an extensive factory in High street. The Japan is made on the premises, the proper combination of materials being a secret with its inventor. Its general utility in the arts is very great. Mr. Conger has devised various ingenious methods for drying the Japan, which may be more accurately termed an enamel. An interesting feature is the "wet room," wherein the mirror-like appearance of the enamel is brought out. This room is kept darkened and very damp, which entirely overcomes the tendency dust particles have for collecting on the bright surface of the enamel. The trays are shaped by stamping; for this purpose the company has one of the largest stamping presses in use. A very ingenious wiring machine, invented by Mr. Conger, is used for finishing the edges of the trays. This machine has both a circular and eccentric motion, making it applicable to oval as well as circular trays. The enterprise was actively opposed by the importers for a time, but this has now ceased, and the importations of these goods to this country has almost entirely ceased. The company make the finest qualities of tea trays, together with the common grades, at a minimum cost.

The Japan is so hard that a tray may be stamped upon without perceptibly injuring the enamel, which is also very elastic, receiving no injury from the bending of the tray. Acids which ruin other Japans in minutes, require hours to destroy that made by this process.

It is quite probable that the United States will have an exporting trade in these goods when their value becomes known abroad.

In addition to the manufacture of tea trays, Mr. Conger has invented and patented several improvements in other household utensils, such as dust pans, children's trays, &c.

Another device of Mr. Conger's invention is an improved zinc stove board, or platform, to protect the carpet and floor from fire. This business has reached a very considerable size. The framework is made of light wood in either circular or oblong form, and over these the sheet zinc is fastened. Machinery is used in making the wooden frames, shaping the zinc, and combining the two in the finished platform. The peculiarity of these boards is a dome-like elevation, rising in regular gradations in the center of the zinc. As at first manufactured, this elevation was produced by a stamping process. The effect, however, of so powerful and sudden pressure in the center of the broad sheets of zinc, was to contract the outer and level rim, crimping and disfiguring it. Before the zinc could be used, this outer rim was annealed and rolled to give it a smooth surface. Repeated annealing rendered the zinc too soft, and when completed, the surface of the outer rim was rough. The rolling process, was slow and expensive, and on this account the boards could not be brought into general use. After a good deal of labor and partial successes, a machine was perfected capable of doing the work. It is called a "Forming Machine," by means of it the dome like elevation in the center of the board is produced by the well known spinning process. This machine, like the drawing press, has a blank holder which prevents the edges of the zinc from wrinkling or puckering. The spring roller begins at the outside, working toward the center. The motions of the machine are all automatic, and its capacity about 2000 zincs per day. It has an eccentric motion, so that oval as well as circular boards are produced. Mr. Conger is now adapting this machine to the production of what are called stamped goods.

#### The New Bessemer Works at Scranton.

The first blow in the new steel mill of the Lackawanna Iron and Coal Co., Scranton, Pa., was made on the 23d ult. The plan is thus described by the Republican of that city:

The building consists of a cupola room, 44 feet span, 71 feet long, and 49 feet high to the eaves; a converting room, 84 feet span, 174 feet long, and 31 feet high; an engine room, 54 feet span, 77 feet long, and 16 feet high; a boiler room, 46 feet span, 73 feet long, and 16 feet high to eaves; all arranged so as to form a rectangle of 124x120 feet. In the cupola room are located 4 cupolas of 7½ feet in diameter, 4 feet in depth of tuyeres, and 15 feet high to charging doors, each capable of melting 5 tons in 30 minutes, also two 6-ton ladles mounted on scales for receiving the molten pig iron from the cupolas, and in which it is weighed before being converted into steel; also 4 reverberatory furnaces for melting the spiegel. In each end of the cupola room is located a hoisting tower, furnished with a hydraulic elevator of 6 tons capacity and 50 feet travel.

The converting room contains two 5-ton converters (egg shaped) of 8 feet external diameter and 15 feet high. These are lined with refractory material 10 inches thick at the bot-

tom of the vessel, and are provided with stout trunnions 18 inches in diameter, and with a hydraulic gear for rotating, mounted on massive beams and columns. The centers of the converters are 10 feet 9 inches above general level. The converters are by means of the hydraulic rotating gear first put in a nearly horizontal position for receiving the molten pig iron; next in an upright position while the iron is being converted, and lastly in a reversed position while discharging the steel. The casting pit is situated immediately in front of the converters, and is 38 feet in diameter, 2½ feet deep, and commanded by a central hydraulic ladle crane of 12 tons capacity. At the extreme end of this crane is mounted a ladle which receives the steel from the converters.

The size of the ingots will depend on the weight of the rail to be produced, but will average 12 inches square and 45 inches long, for 33 foot rails, 65 pounds per yard.

The hydraulic machinery is actuated by a hydraulic duplex force pump having 2 steam cylinders 30 inches in diameter, 2 water cylinders of 9 inches in diameter and 24 inches stroke. The water is forced from these pumps under a pressure of 300 pounds per square inch into a system of pipes which communicates with the various hydraulic motors throughout the works. In the engine room are located 2 independent horizontal and condensing blowing engines, 50 inches in diameter, and a blowing cylinder 54 in. diameter and 5 feet stroke. These furnish the blast to the converters at the rate of 9500 cubic feet per minute, and under a pressure of 20 pounds per square inch. The boiler house is occupied by a battery of 6 boilers of the locomotive type, having each 34 square feet grate surface, 1504 square feet heating surface, and 112 tubes 16 feet in length and 3 inches in diameter.

The iron rail mill owned by this company contains 118 single puddling furnaces, 35 heating furnaces, and 12 trains of rolls. It has an annual capacity of 112,000 net tons of iron rails, and 13,500 net tons of merchant bar iron and car axles. The capacity of the new steel works is 45,000 net tons of ingots. The company also own 6 blast furnaces—5 at Scranton and 1 at Franklin Furnace, New Jersey. This establishment, it will be seen from the above, is one of the largest in the world.

The officers of the company are W. W. Scranton president, and Edward C. Lynde secretary, at Scranton, Pa., and E. F. Hatfield, Jr., treasurer, 52 Wall street, New York.

#### Special Notices.

##### To Let,

A very desirable office at 43 Cliff Street, New York. Possession immediately.

#### HARDWARE BUSINESS For Sale.

In the city of Norwich, Conn., an old stand facing two streets. Business low. Good help and doing a prosperous business. Large back country. The best of reasons given for selling. Address, FULLER & PARISH, Norwich, Conn.

WANTED.—A first-class business man familiar with machinery and manufacturing, capable of handling large bodies of men, desires a responsible position. References satisfactory. Address, IRON AND STEEL, Care of P. O. Box 813, Bridgeport, Conn.

#### WANTED TO PURCHASE A Hardware Business

In a desirable and growing town. Address, giving full particulars, LOCK BOX, NO. 34, Lebanon, Lebanon Co., Pa.

#### Briesen's Patent Agency FOR SECURING INVENTIONS, TRADE MARKS, &c., IN AMERICA AND EUROPE.

No. 258 Broadway, New York. A. V. BRIESEN.

#### TO CAPITALISTS.

By virtue of an order of the Orphans' Court, the undersigned will offer at public sale, in Centre Square, in the borough of Easton, Northampton Co., Pa., on

FRIDAY, NOV. 26, 1875,

At 10 o'clock, A. M., a tract of land situate in the said borough, containing about four acres, on which is erected a valuable

#### SHEET IRON ROLLING MILL

In full operation, and thoroughly equipped with all the necessary machinery, tools and implements for the manufacture of sheet iron in large quantities, including one large and one small steam engine. The tract has a good wharf on the Lehigh River, and the mill is connected with the lands of the Lehigh and Susquehanna Railroad Co. by siding. There are also upon the premises two large brick buildings suitable for warehouses, a building for annealing and seven frame dwelling houses.

The terms and conditions will be made known at the time and place of sale, by

JULIA F. OLIVER, Administratrix.

EASTON, NOV. 1875.

#### AT DANBURY, CONN., To Rent, with power,

an extremely desirable room, 40x100 feet, being a part of the second story of our machine shop. Thirty windows, 3x5 feet, 10 ft. ceiling, heavy double floor, Otis Elevator, Water, Gas, Steam Heaters, Fire Extinguishers, &c.

Suitable for any kind of light manufacturing taking less than 25 horse power. The tracks of the Housatonic R. R. on the one side, and Danbury & Norwalk R. R. on the other, are both within easy speaking distance. Twelve trains leave here daily, reaching New York in 3½ hours; New Haven, 2½ hours; Bridgeport, 1½ hours; Norwalk, 1 hour, &c. Any part or the whole of the above will be rented on long or short lease. Terms and other particulars made known on application to

THE HULL & BELDEN CO., Mfrs. Machinists' Tools & Drop Forgings, Danbury, Conn.

#### Special Notices.

##### Wanted.

By a stock company located near New York, having machinery, power and tools for manufacturing all kinds of Brass Goods, association with a party having an established trade, with limited facilities and capital, or good invention, which they would like extended and introduced. Address

ENTERPRISE, Office of The Iron Age, 10 Warren St., N. Y.

#### DISCOUNT LISTS.

Hinges, Stanley Works' list, 10¢ to 50¢ each, 75¢ and 50¢. Union Mfg Co.'s, 10¢ to 80¢. Bolt, File and Ring and Butt List—Contains all the lists and discounts that are used. Price \$1.00. Dayton & Lamerson, 97 Chambers St., N. Y.

#### SPECIAL NOTICE.

I have three patents for Dies, Machinery, and Tools for making Augers and Bits, each running seventeen years; dated as follows: Dec. 19, 1865; January 31, 1866; and July 3, 1866. There is a special claim on each of the Dies. All persons infringing on said patents will be held responsible to the extent of the law. Russell Jennings. DESP. RIVER, Conn., Sept. 7, 1874.

#### WANTED TO PURCHASE, 100 tons good Second-Hand T Rails, 18 or 20 lbs. per yard.

Address, giving particulars, PIPER & THOMPSON, Lapeer, Mich.

#### TO LET, A Light, Handsome Office.

Possession Immediately.

HERMANN BOKER & CO., 101 Duane Street, N. Y.

#### MANUFACTURERS

desirous of introducing their goods to the British and Continental Markets, are advised to insert advertisements in the newspaper "IRON," published every Saturday, at 99 Cannon Street, London, E. C.

SCALE: First 3 lines, 9¢; every additional line, 10¢. Price, 6¢ per Copy, or 30¢ per annum, inclusive of postage to the United States.

#### Steel Castings.

Solid and Homogeneous. Guaranteed tensile strength, 25 tons to square inch. An invaluable substitute for expensive forgings, or for Cast Iron requiring great strength. Send for circular and price list to

CHESTER STEEL CASTINGS CO.,

Ev-lina St., Philadelphia, Pa.

#### NEW HARDWARE STORE, AT NATCHEZ, MISS.

Manufacturers and Jobbers please send price lists, &c. I want the agency for any good paying article. Can give good references, in Natchez, New Orleans and elsewhere.

Address, A. L. PERRAULT.

#### AN IRON COMMISSION HOUSE

Having an established connection in London, wish to represent through Europe some American Manufacturer of Agricultural Implements or something similar. Only a first-class article will be taken up.

Address, B. A. J.,

Office of The Iron Age, 10 Warren St., N. Y.

#### Important to Manufacturers.

BISSELL, WELLES & MILLET, Auctioneers and Commission Merchants, No. 15 Murray St., New York. Solicit from Manufacturers and others consignments of Hardware and Cutlery for our weekly Auction Sales to the Trade, or at private sale for cash, as desired. Our facilities for moving large lines of goods are unsurpassed. Advances made if desired.

#### 25 per cent. extra power

Guaranteed to owners of Steam Engines, or of any kind of Machinery, by the use of Ransom's Syphon Condenser.

T. SAULT, Consulting Engineer, General Agent, New Haven, Ct.

#### Business Opportunities.

New Capital Procured, Partnerships Arranged, and Commercial, Mining and Banking Corporations Organized, by CLARKE, CHITTY & CLARKE, Board of Trade Office, New York. P. O. BOX, 4071.

#### Merchant Iron or Nails

Wanted in exchange for 300 tons No. 1 Wrought Scrap Iron.

GILCHRIST & GRIFFITH,

Mount Pleasant, Iowa.

#### A. PURVES & SON,

Corner South & Penn Streets, Phila., Dealers in Scrap Iron & Metals, Machinery, Tools, Shafting & Pulleys, Steam Engines, Pumps & Boilers, Copper, Brass, Tin, Rabbit Metals, Foundry

Facings. Best Quality Ingots Brass. Cash paid for all kinds of Metals and Tools.

#### DROP FORGINGS.

The TRENTON VISE & TOOL WORKS, Trenton, N. J., having increased their facilities, are now able to do all kinds of

Iron and Steel Drop Forgings in quantities to order at reasonable rates.

HERMANN BOKER & CO, Proprietors, 101 & 103 Duane St., N. Y.

#### Wanted—A Partner,

In a foundry and machine business, already well established. Locality splendid and healthy. A practical man with means is wanted to join a practical man who is already well established.

Address, CAR WHEEL FOUNDRY, P. O. Box 134, Selma, Alabama.

#### Special Notices.

Complete Illustrated Catalogue free. Fine Machinists' & Amateur Tools AND SUPPLIES OF ALL KINDS. Foot Lathes, Foot Power Scroll Saws, Centennial Foot Grindstones, Taps and Dies, LeCount's Lathe Dogs, Morse Twist Drills, &c. Discounts to Trade. JACKSON & TYLER, No. 16 GREENMAN ST., BALTIMORE, MD.

##### For Sale.

##### For Sale.

The Stock and Good Will of an old established Retail Hardware Store in the city of Philadelphia, recently come into our possession. Apply to

LLOYD, SUPPLEE & WALTON, 635 Market Street, Philadelphia.

#### FOR SALE CHEAP.

One No. 2½ Ball's Planer and Mather, not used 6 months. One No. 2½, Wetherby Stagg and Richardson Planer and Mather, used same time. One No. 5 Ball's Planer and Mather, used same time. One Daniel's Planer, 30 in. wide, 18 ft. long, almost new. One No. 4 "Fitchburg" Drill, almost new. One Vreeland Iron Planer, 36 in. wide, and 11 ft. long, almost new.

CHARLES PLACE, 103 Reade St., N. Y.

##### For Sale,

##### Stove and Tin Business.

Will sell, on good terms, one of the best arranged House Furnishing Stores in Canada West, at St. Thomas. The premises are roomy, the buildings having been arranged especially for this trade, with Tinsmith's workshops and benches complete for 13 men.

#### Present Stock about \$6000.

St. Thomas is the head quarters of the Canadian Southern Railway Co. To a practical, energetic man this offers unusual advantages. Business well established and with good connections. Reason for disposal, present proprietors increasing their wholesale and retail Hardware Store next door to the above premises. Address

HORSMAN & HORSMAN, Iron and Hardware Merchants, St. Thomas, Canada West.

#### ELEY BROS.,

Brown Cartridge Cases, 10 Gauge, for Pin Fire Breech Loaders,

#### FOR SALE CHEAP.

ALFRED FIELD & CO.,

93 Chambers and 75 Reade Streets, N. Y.

#### FOR SALE.

At Lowest Manufacturers' Rates,

#### GUNS & SHEET ZINC,

Best German and Belgian Brands,

By LOUIS WINDMULLER & ROELKER,

30 Reade Street, N. Y.

#### FOR SALE.

#### Rolling Mill and Bridge Building Machinery.

#### OF NEW ENGLAND IRON COMPANY.

Upright Corlis Engine, 33 in. cylinder, 5 ft. stroke; wheel, 32 tons, 35 ft. diam. Puddling Train, Merchant Train, 16 in., built by Totten. Rotary Squeezer, Etc., Etc. Testing Machine. Bolt Cutters. Milling Machines, and all Machinery necessary for Bridge Work. In lots to suit. Apply to

WM. E. COFFIN & CO., 8 Oliver Street, Boston.

#### Valuable Furnace Site

#### FOR SALE OR ON ROYALTY.

Possessing ingredients to make Car Wheel Charcoal Pig at \$14.75 per ton. Any head of water power, Forest, Iron Ore 70 per cent., Limestone, Clay, Refractory Stone for construction abound together, same property; makes best neutral flange iron.

H. C. WYETH, Baltimore, Md.

#### For Sale.

A first-class Hardware Business, located in the thriving city of Bloomington, Ill. Above business has been established for over twenty (20) years, and presents to any one desirous of doing an "A No. 1" retail and jobbing trade a most favorable opportunity. Amount of stock about \$15,000. Will be sold at a sacrifice. Ample reasons given for selling. For further information, address

GEO. BRADNER, Bloomington, Ill.

#### FOR SALE.

An ¼ inch mill train for making Merchant, Band and Hoop Iron. Will be sold cheap.

Apply to W. W. JONES,

Near the Lehigh Valley Railroad Depot, Allentown, Pa.

#### A BLAST FURNACE FOR SALE

at Napanoch, Ulster Co., State of New York, on the Delaware and Hudson Canal, with extra facilities, and a capacity of 20 tons per day Anthracite or 15 tons of Charcoal, together with a splendid water-power, goes with the furnace. The furnace is in good order and could be put in blast in a short time. Will be sold very low on accommodating terms. Charcoal can be had for many years.

Address, H. H. HANGE,

94 Gold Street, New York City.

#### FOR SALE,

at 10c. a copy, Weekly Spanish Review and Price Current. The undersigned is also a Translator from and into the English, Spanish, French and German. Latest Translations made: for the governments of Germany and Spain. Pacific Mail S. S. Co. Walter A. Wood; Morris, Wheeler & Co.; Todd & Raftery; John T. Dunkin; Fleck & Hatch; R. W. Wilde; Wilson Sewing Machine Co.; J. Hess & Co.; H. Marquardt; M. Echeverria & Co., and Chas. E. Little, New York; Hocking Valley Mfg. Co.; W. F. Felt, Son & Co., Phila.; Atlantic and Pacific Land Co.; B. E. Flemming, Jersey City; Wilder & Co., Savannah, and the Tanite Co.; Stroudsburg ("Emery Grinder"), to whom he refers.

C. KIRCHHOFF, Metal Reporter of "The Iron Age," Box 3091, New York P. O.







we are continually hearing of some discovery or other which verges on something very closely approaching to what may at any moment completely revolutionize our present modes of iron



an assignment to Edward R. Wiggin, of Boston,  
and Eben F. Bacon, of New York.



## Some Recent Developments in the Technology of Iron.

It is generally admitted that the yield and capacity of a furnace do not increase in equal proportions. On this point M. Gruner draws some striking comparisons from the figures quoted in the discussions of the Iron and Steel Institute, tabulated below:

Height in feet.	Internal capacity, cubic feet.	Elements of Furnace.
20	5,000	Newport old (S'th B'nk) 1854.
30	10,000	Clarence, 1853.
40	15,000	Clarence, 1866.
50	20,000	Bolckow and Vaughan, 1865.
60	25,000	Clarence, 1865.
70	30,000	Newport, 1864.
80	35,000	Ferryhill.
90	40,000	Bolckow and Vaughan, 1868.
100	45,000	Clarence, 1870.
110	50,000	Newport, 1870.
120	55,000	Ferryhill.

In the old small furnaces of about 6000 cubic feet, it would appear that the mean capacity per ton of pig is 210 cubic feet; in the medium sized furnace of 10,000 to 15,000 cubic feet, about 300 cubic feet; and in the modern 25,000 cubic feet furnace, the average capacity per ton is about 450 cubic feet. On the Continent, with moderate sized furnaces, the yield averages a ton of mottled pig for 100 cubic feet, and a ton of gray for about 250 cubic feet.

It has been seen, however, that at Dowlais, the exceptionally excellent result of a ton of Bessemer pig for about 115 cubic feet capacity has been obtained. So, again, taking the Newport furnaces, with capacities closely approaching the ratios of 1, 3 and 6, we find the production in the proportion of 1, 2 and 3, or the 1870 furnace of six times the internal capacity of the 1854 structure, giving only thrice its productive capacity. In other words, as Gruner says: "The descent of the charge requires 60 to 70 hours in the large furnaces and only 20 to 40 in the small ones."

It would seem, then, at first sight, that on this ground of mere increased production the big furnace has no *raison d'être*, but other considerations arise which modify this conclusion. In the first place, a furnace of, say, 30,000 cubic feet capacity does not cost twice as much as the 15,000 cubic feet furnace, nor anything approaching that proportion. Then, again, as Mr. Samuelson has pointed out, the stack itself only costs about one-quarter the expenditure required for a complete blast furnace plant, and the cost of the necessary plant of a big furnace is still further, than in the case of the stack itself, from being double that of the plant of a medium furnace. In fact, Mr. Samuelson, who has had the best possible opportunity to form reliable conclusions on this point, goes so far as to say that the cost of the larger furnace is to that of the smaller as 100 to 90. But, in addition to the question of first cost, it is to be considered that the labor costs of the small furnace will be probably not 30 per cent. less than those of the furnace with a 50 per cent. higher productive capacity. With thoroughly efficient lifts and charging arrangements, one extra charger and an extra furnace man will generally be a sufficient addition to the hands employed on a moderate sized furnace to enable the larger stack to be efficiently tended. Concentration is the essence of technical economy, and is eminently favored by apparatus of large proportions.

Moreover, if we carry out Gruner's reasoning to its logical sequence, viz., that the smaller the number of furnace cubic feet per ton produced the greater the economy—we are landed in a dilemma; for on this basis Fischer's diminutive Vordenburg furnace, with a capacity of only 60 cubic feet per ton, or the Tuscan furnaces, with under 40 cubic feet per ton, should be taken as our ideal rather than the modern English pattern.

The advantages—beyond that of increased productive capacity—of large dimensions in a blast furnace must be looked for in the operations of certain definite causes which may be classed as follows:

The more perfect abstraction of their sensible heat from the gases, when they have to pass through a large mass of comparatively cool material before their escape.

The exposure of the ores to the reducing action of the gases during a longer period, so that the same volume of gas may exert its reducing action to the greatest advantage; or, in other words, that the gases may be oxidized to their maximum extent.

The production of a "grayer" pig of more uniform quality, and the more regular working of the furnace.

The removal of the reducing zone to such a distance from the hearth as to prevent the re-

duction of CO<sub>2</sub> by carbon from becoming excessive.

As it is generally admitted that the extension to some 13,000 or 14,000 cubic feet has been beneficial, it will be convenient to have regard chiefly to the circumstances which the opponents of a larger class of furnace have selected as likely to operate as a bar to further beneficial enlargement. The general proposition, that the larger the furnace the cooler the gases, is controverted on several grounds, and must be considered in the light of many modifying circumstances. That the gases of very small furnaces are hotter than those of a larger class was first observed by Parry, and the importance of the margin for economy thus opened out may be estimated by comparing the loss from this source in cwt.-units per ton of pig in different furnaces, thus:

	Clarence.	Consett.	Consett.	Clarence.	Ormesby.
Cubic feet.....	6,000	9,000	10,300	11,500	20,500
Loss, cwt. units.....	15,466	15,160	6,060	10,900	18,990

Bell estimates the loss from this cause in a 6000 cubic feet furnace as equal to the heat from the combustion of about 5 cwt. of coke. How much of this can be saved? That is to say, to what temperature can the gases be reduced? To this Bell would probably say that with calcined carbonate ores 300° C. is the lowest average that may be hoped for, though Gruner recognizes the possibility of cooling another 100°; while Cochrane asserts that the former is more than four times too high a temperature for the gases of a sufficiently capacious—say, 50,000 cubic feet—furnace.

Now, it is well known that the rapidity with which a heated gas, or other body, imparts its heat to surrounding bodies is proportionate to the difference of their temperatures. So gases at 400° will be reduced to 300° by contact with iron stone at, say, 100°, much more rapidly than they will lose another 100 deg. by further contact with more iron stone at 100°. This fact alone renders the depriving of the gases of their last 300° or 300° of excess heat, a much slower process than the commencement of the cooling process. It is also to be remembered that when the ore is charged still hot from the calciners a further obstacle to the entire abstraction of heat is introduced. Then, again, it has been seen that when a mixture of carbonic acid and carbonic oxide comes in contact with FeO<sub>3</sub>, at any temperature over 300° C., dissociation of the carbonic oxide ensues, with deposition of carbon and the formation of carbonic acid, and that this reaction is attended by the evolution of some 3000 heat units per unit of carbon deposited. Now this action is beneficial in one respect, inasmuch as it increases the proportion of CO<sub>2</sub> to CO in the escaping gases; but, on the other hand, it has a tendency—on which Gruner lays great stress—to keep their temperature constant. Bell relies also on the alleged heat development from the reduction of FeO<sub>3</sub> by carbonic oxide, as rendering it impossible to cool the gases beyond a point already reached in many moderate furnaces. With regard to each of these assertions, it may be pointed out that, as it has been proved possible to reduce the gases to below 320°, and neither dissociation nor reduction take place to a perceptible extent at this temperature, the influence of both of these actions may be eliminated in the consideration of the possibility of further reducing the temperature of the gases; as they would not come into play at all. Subjoined is a list of gas temperatures from furnaces of various sizes:

Number.	Capacity in 100 cubic ft.	Temperature, Deg. C.	Number.	Capacity in 100 cubic ft.	Temperature, Deg. C.
1.....	330	166	7.....	130	453
2.....	300	191 A	8.....	115	331
3.....	250	308 B	9.....	102	248
4.....	305	412	10.....	60	452
5.....	190	197	11.....	49	100
6.....	180	313	12.....	40	250

Though an attempt has been made to select average temperatures, the fluctuations at different periods of the day, and under the influence of varying charges, detract greatly from the value of these observations. There is, however, a general decrease of temperature with increase of capacity observable, when exceptional experiments are removed. Thus, Nos. 9, 11 and 12 being removed (of which the latter are certainly not comparable with the others, owing to the ore used being raw and wet and other differences), much of the want of uniformity disappears. Still, it must be allowed that the results are irregular and unsatisfactory. The gases from 2 A are practically the same temperature as those from No. 5 working on the same ores; so, again, two Eston furnaces, of which one has 10,000 cubic feet greater capacity than its fellow, have gases of the same temperature. On the other hand, on a large average, the 6000 cubic feet furnace has gases nearly 100° hotter than those of the big furnaces. With regard to the second advantage to be anticipated from great capacity—the saturation of the gases with oxygen—it would seem that this would be probably achieved (i. e., so far as it can be influenced by the size of the furnace) when the gases leave the furnace top with a temperature below 350°, since the reductive action of gases of ordinary composition would be exceedingly trifling below that temperature. Bell finds that the ratio  $\frac{CO_2}{CO}$  is, at the Clarence Works, rather higher in the 11,500 cubic feet furnace than in the 25,500.

As to the quality of pig, though there is a general consent to the fact of the inferiority of small furnace Cleveland iron, we find Bell holding the opinion that the 15,000 cubic feet furnace makes rather better iron than its superiors in dimensions, while Samuelson insists that his 30,000 cubic feet furnace pig is at least a number grayer than the product of the medium

furnace. This is a point which can only be established by a lengthened experience and a large number of analyses. On the remaining question which affects the economy of capacity, we may have to say something under the head of the influence of hot blast.

One objection, which is constantly urged against increased dimensions, is the crushing of the ore and fuel, with ordinary charges and consequent resistance to the blast and derangement of the furnace. This appears to be the main reason for the cutting down which has been carried out on tall stacks at Consett, Barrow, Creusot and elsewhere, where the hard coke and ironstone of Cleveland are absent.

Is this an insuperable difficulty? From the "Transactions of the Institute of Mining Engineers," we find that certain American anthracite stacks 72 feet high, work admirably, though, as the specific gravity of the charge is double that of a Cleveland charge, the crushing pressure must be equal to that which would exist in a Cleveland furnace of 144 feet high. Truly anthracite is hard, but, on the other hand, it deprecates to such an extent that it was long thought impossible to use it in any but dwarf stacks. So, also, a 61 foot charcoal furnace, suddenly run on anthracite, worked well and continuously, though the tender charcoal must have for some time borne a column equal in weight to over 100 feet of a Cleveland burden. In Staffordshire, also, as at Old Park, the anticipated difficulties from crushing when old 45 feet stacks have been raised to 60 feet have not proved serious, while a marked economy in fuel has resulted from the alteration in dimensions. What is wanted to enable tall furnaces to work weak burdens, is to have a blast powerful to make its way through and break up incipient scaffoldings. Introduce the American 7 or 8 lb. of blast, and we should hear much less of cutting down.

At Clarence Works furnaces of capacities in the proportions 11, 15 and 25, at Eston, furnaces whose proportions are as 15, 20 and 27, are found (working on similar materials) to be one not more economical or otherwise superior to the other. At Ferryhill, furnaces of 43 feet, 80 feet and 103 feet consume, respectively, 30, 20 and 17½ cwt. of coke per pig ton. At Newport, with furnaces of 30, 16 and 5000 cubic feet, they consume, per pig ton, 30, 22½ and 33 cwt., respectively. With such contradictory verdicts on the question of the economical limits to capacity, one may well cry "Facts! more facts!" and refrain from propounding any dogmatic dictum on the subject.—Iron.

## Frameless Houses.

While many changes have been made in interior decoration and convenience within the last few years, house building itself has not materially departed from the "balloon frame" idea for a long time. Recently, a method of construction that dispenses with framing, boarding, lathing and plastering, has been patented, and is already attracting some attention. By this method the substructure up to the sill is prepared as for an ordinary wooden house. The sill is then placed, and firmly bolted down to the masonry. Solid wooden staves, 3¼ inches, and of different lengths, are then prepared, and in each is cut a groove 1½x1½ inch the whole length on each side. One inch holes are then bored through the sides at intervals of 18 inches. These, with a number of iron rods, bolts, nuts, and tongues, make the entire materials for the house, excepting ornamental work that may be put on with or without. Three staves, equal in length to the intended height of the house, or the first story, if it is a high one, are set up outside of the sill, and firmly bolted to it. Between each piece is placed the iron tongue, reaching the whole length, and between the three are placed iron rods through the horizontal holes. Three more staves, each with its iron tongue, are then set up, and more rods are inserted, while those extending through the six staves are screwed up tight.

In this manner the entire exterior wall is set up. The tongues close the cracks tight, and the rods, arranged to break joints, hold everything firm and solid. For doors and windows, spaces are left, to be closed and finished afterward in any style desired. The first floor, made of the same materials, is laid in the same way, and tension rods, secured to the walls, are placed below to give support and strength. The partitions are set up in the same manner, and over these the second floor is laid as before. The roof (of any pitch) is laid down in the same way, except that each stave is channeled, and each crack is covered with a half round batten to shed the rain. To secure the roof from spreading, tension rods are placed under each pitch, and fastened together by tie rods.

Balconies, piazzas, and porches, made in any desired style, may be added, and all the ornamental work, base and weather boards, etc., are fastened directly to the wall. The iron work is designed to be galvanized, and all the bolts and nuts are countersunk. When tension rods are used under the floors, they may be bronzed, painted, or otherwise ornamented, or may be treated as part of the gas fixtures. By

this method of construction it is seen that there is no lathing or plastering, no dead spaces in the wall for fire or rats to creep unseen in, no opportunities for the builder to hide poor work. All the material is visible, and the walls are alike outside and in. The exterior may be painted and the interior oiled, varnished, or papered. The natural wood—spruce, pine, etc.—makes a good interior finish, and for seaside cottages, railway stations, and small churches, varnishing would be sufficient.

A building of this character can be erected in sixty days after the substructure and cellar are ready—thirty days for getting out the materials and thirty days for setting up. In cost, a saving of 33 per cent. is claimed over a frame building of the same size. For seaside and summer houses, railroad stations, churches, etc., this method of building presents points of interest and value.—Scribner.

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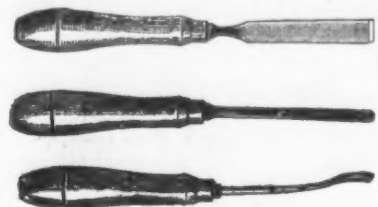
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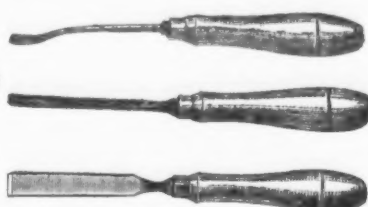
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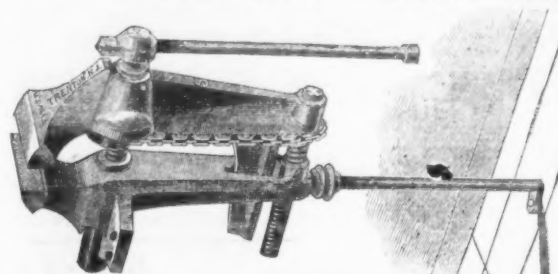


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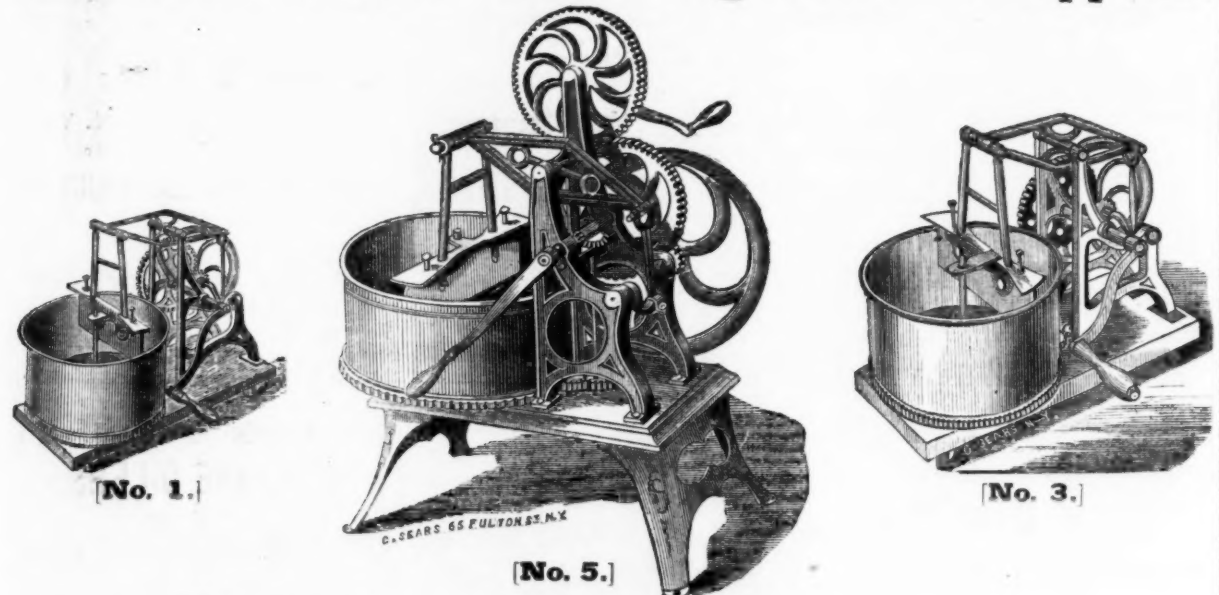
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4	10	10	1 1/4	1 1/4	1 1/4	36	10 1/2	32	24.00
5	12	12	1 1/2	1 1/2	1 1/2	42	12 1/2	40	32.00
6	14	14	1 3/4	1 3/4	1 3/4	48	14 1/2	48	40.00
7	16	16	2	2	2	54	16 1/2	56	48.00
8	18	18	2 1/4	2 1/4	2 1/4	60	18 1/2	64	56.00
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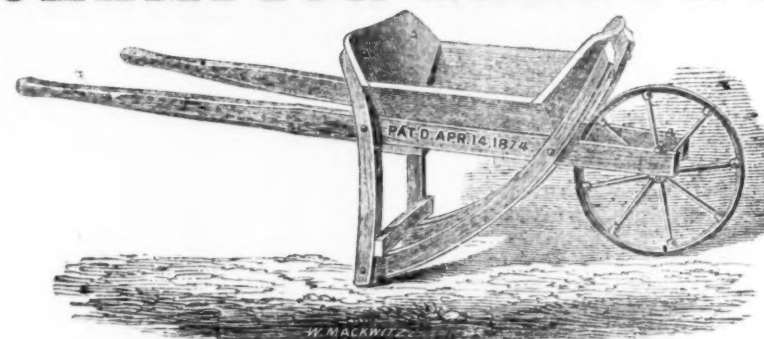
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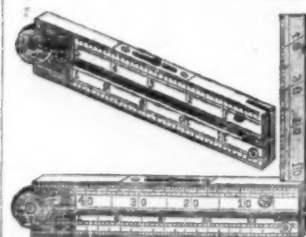
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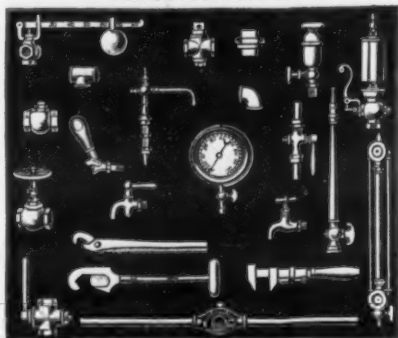
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Salesrooms, 112, 114 and 116 LAKE STREET,

Works, MICHIGAN, KINZIE and ST. CLAIR STREETS,

CHICAGO.

Steam, Gas and Water Supplies,

BOILER MAKERS' SUPPLIES,

Cornice Makers' Supplies,

MALLEABLE GRAY IRON AND BRASS

CASTINGS to Order.



## The Acme Pipe Cutter.

MADE ENTIRELY OF SOLID CAST STEEL.

Cuts Wrought Iron, Brass and Copper Pipes, Round Iron &c perfectly true without leaving burr on pipe, contracting or splitting it. Cuts out a chip similar to a lathe tool. The knife may be removed and ground. Send for descriptive circular to manufacturers.

**Pancoast and Manle**  
PHILADELPHIA PA.



WM. ESTERBROOK

Wholesale Manufacturer of

Coal Hods,

FIRE SHOVELS, Etc.

311 Cherry St., PHILADELPHIA.



## R. D. WOOD &amp; CO.,

Philadelphia,

Manufacturers of

## Cast Iron Pipe

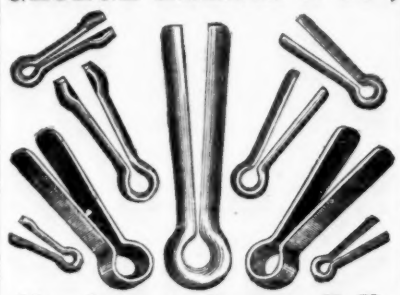
FOR WATER AND GAS.

Lamp Posts, Valves, &c.,

Mathew's Pat. Anti-Freezing Hydrants.

400 CHESTNUT STREET.

## GEORGE BARNES &amp; CO.,



Manufacturers, Syracuse, N. Y.

## ENCAUSTIC TILES.

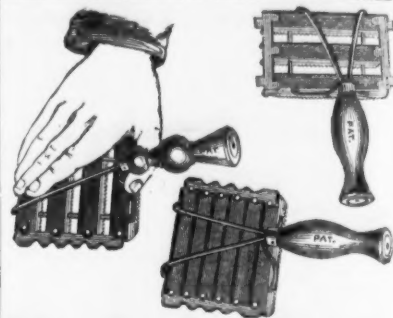
ALEXANDER FINDLAY,

Importer.

99 MAIDEN LANE, N. Y.

Sole Agent in U. S. for

CRAVEN, DUNNILL & CO., (Limited).



## The Perfect Comb.

We call your attention specially to our new patent endless wire comb. The result of a long series of experiments, made with a view to meeting all the requirements of a Perfect Comb. It is better, stronger, and more durable than any ever before invented. The raised wire shank gives what has never before been attained, viz: a rest and brace for the thumb, in such a position that the hand cannot come in contact with the horse when using the comb. The wire braces which run from the shank over the back to the front teeth give strength and durability in a direction never heretofore attained, and at the same time serve as an extra handle; and when clasped by the fingers in connection with the raised shank the comb is more firmly, easily, and completely held, and with much less fatigue to the hand than is possible in any other formation—in short, it needs but a trial to vindicate a name: The Perfect Comb.

## THE LAWRENCE COMB CO.

Factory and Office,

382 2d Ave., cor. 22d St., N. Y.

## WM. S. CARR &amp; CO.

Sole Manufacturers of

## CARR'S

Patent Water Closets,

PUMPS,

Cabinet Wood Work, Vases, &c

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Factory, Mott Haven, New York.

PAT. DEC 23, 73  
BLAKEMORE'S GRAVITY DOOR ALARM  
USE NO SPRING  
MANUFACTURED 3425 MARKET ST. PHILA.  
SEND FOR CIRCULAR

## EDWARD BARR,

78 John Street, NEW YORK.

Tubes for Gas, Steam & Water,

1/4 to 14 inch. Gas, Steam Fitters', Plumbers' and Machinists' Supplies. Boiler Tubes, Iron and Steel Boiler Plates, Rivets, Tools, Etc. Railroad Cars and all kinds of Railway Supplies. Iron and Wood Work for Cars, Bridges and Buildings.

Agent for W. C. ALLISON & SONS.

## J. AUSTIN &amp; CO.,

168 Fulton Street, N. Y.,

Proprietors and Manufacturers of

WHEATCROFT'S SELF-ADJUSTING



## Pipe Wrench,

AND

Scripture's Funnel Top

MACHINE OILERS.

Dealers in

STEAM AND GAS FITTERS TOOLS.

RIEHLER BROTHERS,  
N. Ninth Street, above Market, Philadelphia.  
New York Store, 38 Liberty Street.  
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"Patented" Furnace Charging Scale.

Double Beam R. R. Truck Scale, Compound Parallel Crane Beams, &c. Patented First Power Lever Wagon Scales. Testing Machines any capacity. Send for Illustrated Price List.

## CHAPMAN VALVE MFG. CO.,

77 Kilby Street, Boston.

Water,

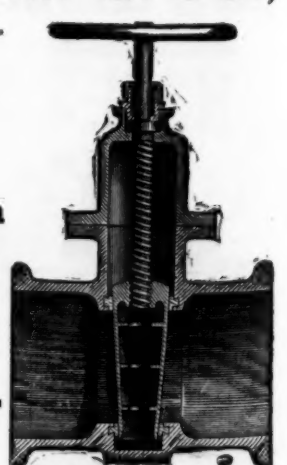
Gas

AND

Steam

## VALVES.

Hydrants.



Send for circular.







**PEEKSKILL FIRE BRICK WORKS.**  
Established 1831.  
**HORTON & MABIE,**  
Manufacturers of  
**Fire Brick of all kinds,**  
STOVE AND RANGE LININGS

of every description. Linings for Cupola or  
Foundry Furnaces. Blocks, Tiles, McKenzies  
Cupola Brick, &c.  
FIRE CLAYS, FIRE SAND & FIRE CEMENT.

**A. HALL & SONS,** Perth Amboy, N. J.  
ESTABLISHED 1846.

**HALL & SONS,** Buffalo, N. Y.  
ESTABLISHED 1866.

**FIRE BRICK**  
of reliable quality for all purposes, manufactured of the  
best New Jersey Fire Clays. Also, ROCKINGHAM  
WARE, YELLOW WARE, Fire Clay, Fire Sand, Kaolin  
Ground Fire Brick, and Diamond Building Brick.

**HENRY MAURER,**  
Late of the firm of MAURER & WEBER.  
Proprietor of the

**Excelsior Fire Brick & Clay  
Retort Works.**  
Sole Manufacturer of French Pat. Roofing Tiles  
and Hollow Brick.

WORKS: PERTH AMBOY, NEW JERSEY.  
Office & Depot: 415 to 422 East 23d St., bet. 1st  
Ave. and Ave. A, New York.

**BROOKLYN CLAY RETORT  
AND**

**Fire-Brick Works,**  
Van Dyke Street, Brooklyn, N. Y.

E. D. White, Surviving Partner of the late firm of  
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**Manhattan Fire Brick & Enameled  
Clay Retort Works,**

ADAM WEBER, - - Proprietor.  
Office, 633 E. 15th St., N. Y. Clay Retorts, Enam-  
eled for Gas Houses; Retorts for burning raw bone and  
re-burning bone for Bone Black. Fire Bricks, Tiles,  
Blocks, Cupola and Range Bricks of all shapes and sizes.  
The best fire clay from my own clay slips at Perth  
Amboy, N. J.

**Brick Presses,**

**BRICK PRESSES,**

For Fire and Red Brick.

**PATENT STEAM GEARING**

For grinding Clay for Red or Fire Brick, and a  
kind of Brick Machines in general.

Works, 1819 Germantown Ave., Phila.  
**GEO. CARNELL.**

Oldest and Largest Establishment of the kind in the U. S.

**F. L. & D. R. CARNELL,**

1844 Germantown Avenue, Philadelphia

Manufacturers of Pennsylvania Brick Machine  
Little Giant Pipe Machine, Fire and Red Brick  
Presses, Clay Wheels, Tile Machines, Stampers,  
Grinding Pans. Brick Yards fitted out for running  
by steam or horse. Heavy and Light Castings. Send  
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**PERSEVERANCE**

**Iron Works & Machine Shop.**

**MARCUS SCHANTZ,**

Having established himself in the Iron and Machine  
Business in Water St., Perth Amboy, is now pre-  
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STEAM ENGINES, BRICK MACHINES,  
BRICK PRESSES AND TILING MACHIN-  
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and most workmanlike manner.

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Established, 1844.

**Clay Tempering Machines**

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Factory, 309 S. 5th Street, Phila. **S. P. MILLER**

With D. Norton's Saws. 4 Sizes.

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**A SPECIALTY.**

1760. 1875. Sold Cast Steel Pump Augers

A full line always in stock. Socket Shafts, Ring  
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**HARBISON & WALKER,**  
Manufacturers of Benezet and Clarion Brands of FIRE BRICK.



Office and Works, Twenty-Second & Railroad Streets, Pittsburgh, Pa.

**Philadelphia Fire Brick**  
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**Clay Retort Works,**  
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**PHILIP NEWKUMET,**

Successors to JOHN NEWKUMET, Proprietor

manufactures 9-inch Fire Bricks, Tiles, and Blocks

for Rolling Mills, Blast Furnaces, Foundries, Gas

Works, Lime Kilns, Glass Houses, &c., &c.

Articles of every description made to order

short notice, and in a very superior manner.

"CLAY RETORTS FOR SUGAR HOUSES."

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The largest stock of Fire Brick of all shapes and

sizes on hand, and made to order at short notice.

Cupola Brick, for McKenzies Patent,

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Sand. Superior Kaolin for Rolling Mills and Found-

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from my own mines at New Jersey and Staten Is.,

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**Watson Fire Brick Manufactory**

ESTABLISHED 1856.

**JOHN R. WATSON,** Perth Amboy, New Jersey.

Manufacturer of

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For Rolling Mills, Blast Furnaces, Foundries,

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FIRE CLAYS, FIRE SAND, AND KAOLIN FOR SALE

**NEWTON & CO.,**

Successors to

**PALMER, NEWTON & CO.,**

ALBANY, N. Y., Manufacturers of

**FIRE BRICK**

**Stove Linings,**

**Range and Heater Linings**

Cylinder Brick, &c., &c.

**M. D. Valentine & Bro**

Manufacturers of

**FIRE BRICK**

**And Furnace Blocks.**

IN ALL ITS BRANCHES.

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**National Fire Brick & Drain Pipe Wks,**

**CHAS. ANNES & SONS, Props.**

Manufacturers of **FIRE BRICK** all shapes

and sizes

Mines and Shippers of all kinds of **FIRE CLAY.**

Factory at SPA SPRINGS, on Perth

Amboy and Woodbridge, R. R.

Post Office address, Woodbridge, N. J.

**TROY STOVE LINING**

AND

**Fire-Brick Works.**

**BELL & BACON.**

Stove Linings a Specialty. **TROY, N. Y.**

JAS. C. BELL, JR. J. BLUNT BACON.

Established 1845.

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**Fire Brick Works.**

**WM. H. BERRY & CO.**

Manufacturers of all forms and sizes of **FIRE**

**BRICK,** for Blast Furnaces, Rolling Mills, Gas House

and Oven Tiles, and Stove Linings, made to order. Also,

Fire Clay, Kaolin, Sand and Fire Mortar.

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13 Murray St., N. Y.

**PATENT CASES**

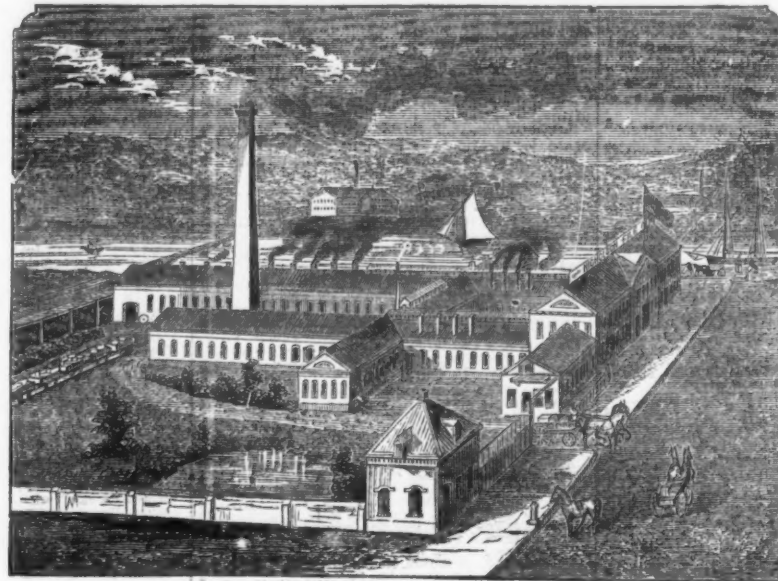
brought or defended in any district of the U. S.

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In the U. S. and abroad, with special aims to strength

and validity, and in shortest possible time. Pamph-

let free. 345 Main St., Hartford, Conn.



**DEALERS AND CONSUMERS**

**OF FILES**

**SHOULD PURCHASE THE**

**Nicholson or "Increment Cut" File**

**FOR THE FOLLOWING REASONS:**

**First.**—They are made from the best quality of File Steel.

**Second.**—Each File undergoes a careful inspection after each operation, by  
critical inspectors, and none but perfect work allowed to pass.

**Third.**—They are cut by the "Increment" or irregular cut, therefore  
combine the advantages of both Hand and Machine work.

**Fourth.**—They will finish finer than Files of any other make of same de-  
gree of coarseness.

**Fifth.**—They will not "pin" or scratch like hand-cut Files.

**Sixth.**—The "Increment cut" File, by our records, will remove more  
stock with a given number of pounds applied than any other File with  
which we are acquainted

**Seventh.**—All Files under seven inches are put up in boxes of one dozen  
each, and neatly labeled.

**Eighth.**—The large stock carried by us, combined with our superior facilities,  
enables us to fill the largest orders at the shortest possible notice.

**Ninth.**—We are constantly making careful tests of our Files by delicately con-  
structed machinery, which automatically records the actual power applied,  
forward, backward and downward, at each stroke of the File, also the number of  
strokes, combined with the work performed, enables us not only to judge of the  
quality of our Steel for wear, but also of the cutting qualities of the  
File, and the ease (expressed in pounds) with which a given amount of work can be  
accomplished.

**Finally.**—Our Files are warranted to be hard, well cut and sound.  
They are exclusively used by many of the largest Railroads and Machinists in the  
country—and the vigorous growth of our reputation, not only for making a good  
article, but of our ability to furnish a good article cheap, is evidenced by  
the large number of Dealers and Jobbers who are handling our Files exclusively.

**NICHOLSON FILE COMPANY, Providence, R. I.**

**SOLD BY HARDWARE DEALERS GENERALLY.**

**CROOKE & CO.,**

MANUFACTURERS OF

**WROUGHT IRON BUTTS,**

All our goods are manufactured from patent faced iron plates; they have a smooth face and bright finish.

163 & 165 Mulberry Street, New York.

**FERNALD & SISE, Agents, 100 Chambers Street, N. Y.**

**Burke & Fraser,**

SOLICITORS OF

**PATENTS**

37 PARK ROW, N. Y. CITY.

Established 1851. Also Consulting Engineers.

**PATENTS.**

Send for circular.

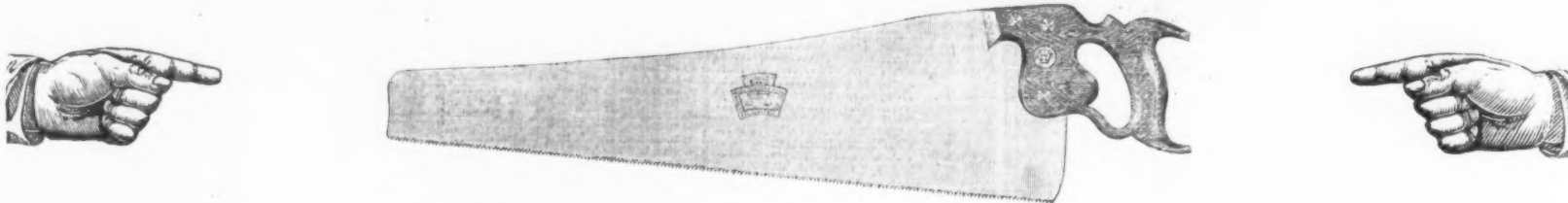
Thomas D. Stetson,  
No. 23 Murray St., N. Y.  
Solicitor of Patents, and  
Scientific Expert in pat-  
ent cases.



# HENRY DISSTON & SONS, Keystone Saw, Tool, Steel and File Works,

Front and Laurel Streets, Philadelphia.

## Henry Disston & Sons New Patent Skew Back Hand Saw "CENTENNIAL No. 7."

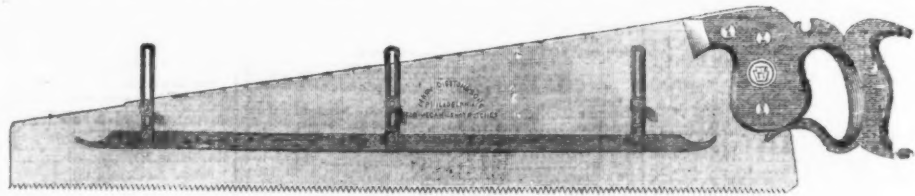


TO THE HARDWARE TRADE.

GENTLEMEN: We are prepared to supply the trade with an entirely new Hand Saw, called the "Centennial No. 7." This Saw is ground on the back, to taper gradually from butt to point, being only 26 gauge at the point. By this mode of grinding, the Saw, when tested, makes a complete "whip bend." The handle is apple-wood, oil finish, the screws are flush and polished, and the Saw is superior to any ever offered to the trade in this or any other country at the price. It is the sweetest-cutting, nicest-hanging Saw that can possibly be manufactured, feeling as light as a feather at the point, owing to its peculiar construction. The screws are finished before being put into the handle, and, should they become loose, can be readily tightened with an ordinary screw-driver, and still make a good finish. It was our intention to keep this Saw from the market until Centennial year; but second thought has decided us to give the trade an opportunity to test it before then, that they may know whether they can put it in stock without risk. The price of this Saw at present will be the same as that of the regular No. 7. It is a "hard times" Saw, and we do not know how long the price can be sustained. Mr. Henry Disston is willing to risk his reputation as a Saw-Maker upon "the Centennial No. 7." Send for samples and put them in the hands of the Carpenters—to be returned if not as represented.

November, 1875.

### GAUGE SAWS, "HAND AND BACK."



The accompanying engraving represents our Patent Gauge Saw, which is an invaluable improvement where a fixed and definite depth of cut is required. For Tenoning, Shouldering, Dovetailing, Curving, Cog-Cutting, etc., it is just the tool. We manufacture them in both Hand and Back-Saws. Remove the gauge from the Hand-Saw and it can be used for any of the purposes to which a Hand-Saw is adapted.

### DOUBLE HANDLE FRAMING SAW.



The advantages of a Framing Saw with a handle at each end are numerous. It can be used by either one or two men. It is particularly adapted for framing. The handles are so constructed that both hands can be used at either end. The thrust is on a line with the cut, and the back of the blade is peculiarly formed. The combination of these principles makes this a very light and easy running Saw.

### STANDARD WIRE GAUGE.

Perfection Attained. Accuracy Guaranteed.

For the past forty years we have had constant trouble with various kinds of so-called Standard Gauges, and have failed to find one in every ten which could be relied on for accuracy. We have repeatedly sent special orders to both English and American makers, but have failed to obtain them true to the required standard.

To insure perfect accuracy, it is absolutely requisite that our gauge and that of our customers should be alike, and to this end we have been compelled to enter the field in this delicate branch of manufacture. Our success is complete, and we are making a correct Standard Gauge which we warrant, and sell at a lower price than the English.



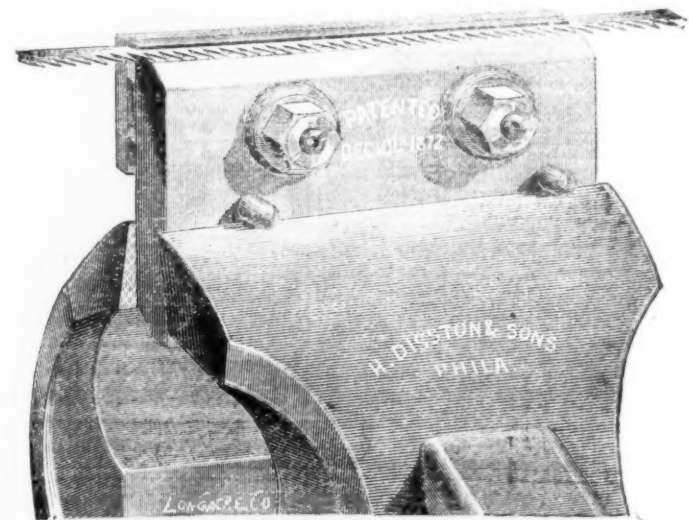
Price for Small Gauges, Nos. 1 to 26, - - - - - \$1.75.



Price of Large Gauges, Nos. 0 to 36, - - - - - \$2.50.  
Special Gauges, Special Prices.

We make them to order in different series of high or low numbers, as the various branches of industry may require. For instance, when the articles to be gauged range between Nos. 0 to 10, the purchaser need not be put to the expense of a gauge running up to No. 36, when most of the numbers will be of no use to him.

Where one or more numbers are being constantly used, they wear away faster in proportion, in which event we recommend that duplicate incisions of each of the most used numbers be made in each gauge.



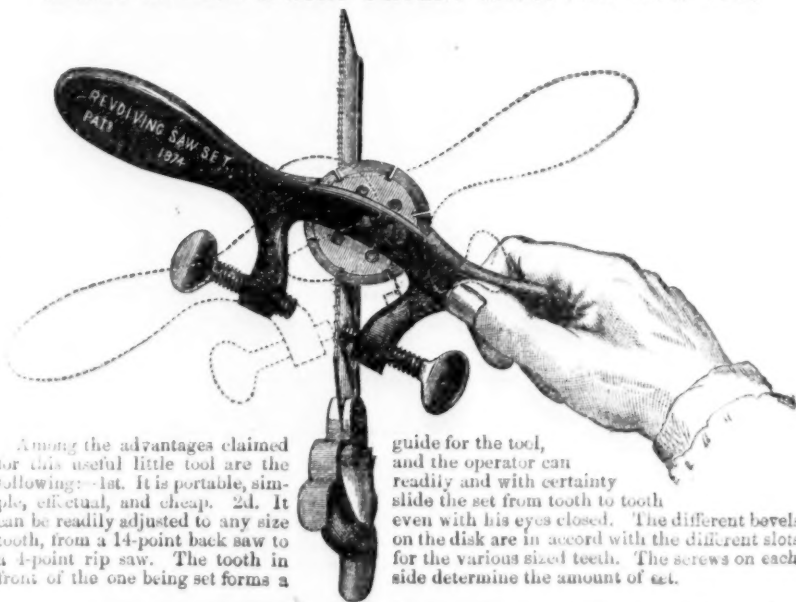
### HENRY DISSTON & SONS' Patent Setting Stake

For Setting Web, Jig, Band or any kind of Narrow Saws.

The principal difficulty experienced in setting a narrow Saw arises from the fact that the blade is liable to tilt or slide backward as each successive tooth is struck by the hammer. The back guide with its projecting lip, under which the Saw passes and is securely held during the process, effectually prevents these difficulties and holds the Saw up to its work; thus the operator is enabled to strike the tooth with certainty every time, and prevents any distorting of the saw blade.

The guide can be adjusted to various widths, by inserting or removing packing, as occasion may require. Either edge of the set can be used by reversing the back guide, and as the edges are of different sizes, they are adapted to Saws of different widths. A narrow Saw set by the aid of this Stake remains as straight after as before; a result which cannot be attained by any other means.

### HENRY DISSTON & SONS' PATENT REVOLVING SAW SET.



Among the advantages claimed for this useful little tool are the following:—1st. It is portable, simple, efficient, and cheap. 2d. It can be readily adjusted to any size tooth, from a 14-point back saw to a 4-point rip saw. The tooth in front of the one being set forms a

guide for the tool, and the operator can readily and with certainty slide the set from tooth to tooth even with his eyes closed. The different bevels on the disk are in accord with the different slots for the various sized teeth. The screws on each side determine the amount of set.

No. 1, large size, - 75 cents.  
" 2, small " - 50 "

HENRY DISSTON & SONS, Front and Laurel Sts., Philadelphia.



Leach's Patent Wire Cutters.....	per doz \$6 00—dis 15 %
Gas Pliers.....	dis 25 %
<b>Plumbs and Levels.</b>	
Stanley R. & L. Co.'s Pat. Adjustable.....	dls 65c-10 %
on Adjustable.....	dls 65c-10 %
Chapin's.....	dls 65c-10 %
Standard Rule Co.'s New Adjustable.....	dls 60c-10 %
Standard Rate Co.'s Non-Adjustable.....	dls 65c-10c-10 %
Pocket Levels.....	dls 60c-10 %
Johnson's Patent Adjustable.....	dls 60c-10 %
<b>Pulleys.</b>	
For Houses.....	dls 00c-10 %
Jap'd Screw.....	dls 00c-10 %
Brass Screw.....	dls 00c-10 %
Clothes Line.....	dls 00c-10 %
Hay Fork.....	per doz \$4 50 @ 5 00, dls 10 %
<b>Pumps.</b>	
Douglas Clatren, etc.....	new list dis 25 %
S. & F.....	dis 25 %
Union Mfg. Co.'s Clatern and Pitcher.....	dis 25 %
Garden.....	dis 25 %
Cucumber (Barrington & Purry).....	dis 10 %
9 ft. x 8, with 15 ft. pipe.....	\$4.00 net
From 6 to 36 ft., add 2 cents per ft.....	\$4 net
Pump, per ft.; Coupling, 3c, per ft.....	
<b>Punches.</b>	
Belt or Drive.....	per doz \$1 50 net
Spring.....	per doz \$2 50—dls 30c-10 %
<b>Nails.</b>	
Sledge Door, Wrought Brass.....	\$ 44, dis 10 %
Iron, Painted.....	\$ foot 9c—dis 10c-10 %
Barn Door, 7/8, 1 and 3/4 inch.....	dls 60c-10c-10 %
For N. E. Hangers.....	dls 60c-10c-10 %
<b>Rakes.</b>	
Cast Steel.....	dls 35 %
\$5 00.....	9 00 10 00 11 00
Malleable.....	14 teen.
\$5 00.....	5 50 6 00 6 50
11.....	15 15 teeth,
<b>Razor Straps.</b>	
Evan's.....	dls 40 %
Colman Emerson (B. F. Badger or C. Emerson)	
Emerson.....	dls 25 %
Charmy.....	dls 40 %
Thorn.....	dls 10 @ 15 %
Sander's.....	net @ 10 %
<b>Knives and Colony.</b>	
Iron and Tinned.....	dls 55 %
No. 1.....	12
Copper Knives and Burrs.....	dls 25 %
Per lb., 45c 50c 55c 54c 56c 58c 59c 60c.....	14 15
<b>Rivet Straps.</b>	
Rods.....	dls 5 @ 10 %
Bar.....	dls 40 %
" American Forge.....	dls 35c-10 %
<b>Rollers.</b>	
Barn Door.....	revised list dis 60, 10c-10 %
dis 10 %	
<b>Rope.</b>	
Manufacturers' List of Sept. 25, 1875.....	dls 14c-10 %
Manila.....	% inch.....
Hay Rope.....	% and 5-lb inch.....
Sisal.....	% inch and larger.....
Sisal.....	% inch and larger.....
Sisal.....	% and 5-lb inch.....
Hay Rope.....	% and 5-lb inch.....
<b>Rules.</b>	
Boxwood.....	Ivory.....
Chaplin's.....	dls 60c-10 %
Standard.....	dls 50c-10 %
Stephens.....	dls 60c-10 %
<b>Sad Irons.</b>	
Front and Back.....	\$ 3 1/2 @ \$3 c net
Sad Iron, Nickel Stand attachment.....	per doz \$10 (0 net)
Self-Heating.....	per doz \$10 (0 net)
Fallows.....	per doz 25 50 net
<b>Sash Panes.</b>	
Beader & Adamson's Flint, 10 to 1 1/4.....	\$4 25 w rem
" " " " 2 1/2 & 3, 4 7/8.....	dls 15 %
" " " " Assorted.....	\$ 25 25 15 %
New England Glass Co.'s Star.....	w rem \$2 50 @ 11 50
H. B. & M. Roman Flint.....	dls 15 %
<b>Sash Cord.</b>	
Common.....	\$ 15 @ 20c net
Silver Lake.....	\$ 24c net
" White Cotton.....	\$ 25c net
" Drab Cotton.....	\$ 26c net
Raw Hide.....	dls 15 %
<b>Sash Locks.</b>	
Clark's Nos. 1 and 2, \$10.00 per gross.....	dls 33c-10 %
Norwich.....	dls 33c-10 %
Walker.....	dls 10 %
No. 2 and King.....	dls 20 %
<b>Sash Weights—Solid Cast.</b>	
Sausage Suffers or Fillets.....	\$ 10 @ 25c
Miles.....	\$ 10 doz \$20—dis 80 %
Stow or Perry.....	\$ doz No. 1, \$15; No. 2, \$21—dis 25 %
Draw Crank.....	each \$30 00—dis 10 %
<b>Saw Frames.</b>	
Saw Rods.....	per gross \$15 00—dis 10 %
<b>Saws.</b>	
Spear & Jackson's.....	\$150 list, dis 10c-10 %
Ash Saw.....	new list
Performance Cross Cut, all kinds.....	\$ 20 foot
Inserted Tooth.....	dls 10 %
Disston.....	dls 12c-10 %
" Mill.....	dls 25 %
" Cross Cut.....	dls 15 %
H. W. Pearce's Circulars.....	dls 25 %
Wm. McNeice & Co.'s.....	dls 30 %
Wm. McNeice & Co.'s Patent Pole Pruning saw.....	new list dis 15 %
K. M. Boynton's Lightning.....	dls 10 %
Others.....	dls 15 %
Wheelers & Clemens Wood.....	dls 15 %
Livingson's Butcher and Kitchen.....	dls 15 %
Livingson's Framed Wood.....	dls 15 %
No. 101 102 103 104 105 106.....	
per set \$12 00 10 00 12 50 9 00 8 00—dis 10 %	
<b>Saw Sets.</b>	
Stillman Genuine.....	\$ doz \$6 00—dis 10 %
" Imitation.....	\$ doz \$2 50—dis 20 %
Common Lever.....	per doz \$2 00 dis 10 %
Leitch.....	\$ 20 \$7 50—dis 10 %
Nash.....	No. 1, \$8 50; No. 2, \$5 50—dis 20c-10 %
Hammer, Hotchkiss.....	\$7 50 dis 10 %
" Aiken's Genuine.....	\$12 00 dis 25c-10 %
" Imitation.....	\$7 50 dis 25c-10 %
Boynton's.....	per doz \$12 00—dis 10 %
<b>Scales.</b>	
Dutton, Counter.....	\$ doz \$36 00 dis 25 %
Ten.....	\$ doz \$15—dis 25 @ 30 %
Union Form.....	dls 15 @ 20 %
Turnbull's.....	dls 15 @ 20 %
Brown's.....	dls 15c-15 %
Edwards.....	dls 15c-15 %
Dove's.....	dls 15c-15 %
Harrison's Grocers.....	dls 25 %
Universal Family.....	dls 25 %
Scale Beans.....	dls 10 %
No. 1 to 100 lbs.....	20c w cwt
No. 2.....	15c w cwt.....
<b>Scrapers.</b>	
Scraper, 1 Handle.....	per doz \$2 00, dls 10 %
Foot.....	per doz \$2 00, dls 10 %
hip (Common).....	per doz \$3 00 net
" "	



## Shears and Scissors.

Cast Steel, New List July 15, 1875.	dis 30
Best Quality Shears and Scissors.	dis 30
Standard Quality Shears and Scissors.	dis 30
Seymour's Shears.	dis 40
Scissors.	dis 50
Pruning.	der doz 100
Barnard's Lamp Trimmers.	dis 30

## Shenvers.

Sliding Door, M. W. & Co. list.	dis 30
R. & E. list.	dis 30
Patent Roller.	dis 25
Hathfield's.	dis 30
Russell's Anti-Friction.	dis 30
Sliding Shutter, R. & E. list.	dis 30

## Shovels and Spades.

Ames.	dis 20
Birmingham Shovel Co.	dis 15
Rowland's.	dis 15
Old Colony.	dis 15
Midvale Shovel Co.	dis 20
C. E. Jennings.	dis 20
Dunlop's Shovels and Scoops.	dis 20

## Shovels and Tongs.

Iron and Brass Head, R. & E. list.	dis 20
Polished Steel.	dis 10

## Skates.

Barney & Berry's.	dis 25
W. & B. Club.	dis 25
All Clamps.	dis 25
Clamp.	dis 25
Florence Steel.	dis 25
Spring.	dis 25
All Clamps.	dis 25

## Peck &amp; Snyder's.

No. 1. Blued.	dis 25
No. 2. Nickel Plated.	dis 25
No. 3.	dis 25
Clamp Club Blued.	dis 25
Clamp Club Blued.	dis 25
Clamp Club Blued.	dis 25
Clamp Club Blued.	dis 25

## Acme Club Skates.

Pair \$4.00 \$5.00 \$7.00 \$8.00 \$10.00	dis 20
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## Slates.

Square Frames, Round Corners, by case.	dis 10
Less than a case.	dis 10

## Spoon Shavers.

Iron.	dis 10
Wood.	dis 10
Steel.	dis 10

## Spoon Shave Irons.

Spears & Jackson's.	dis 10
---------------------	--------

## Spoon Shavers.

Thin.	dis 10
By the case.	dis 10
Bartlett.	dis 10
Boardman.	dis 10
Rogers & Bro. A. I.	dis 10
Barby Silver Co.	dis 10
Holmes, Booth & Haydens.	dis 10
Nickel Silver Co.	dis 10
German Silver.	dis 10
Tin (P. S. & W.).	dis 10

## Stocks and Dies.

Hydrotan Stone.	dis 10
Are Stone.	dis 10
Slips.	dis 10
Sand Stone.	dis 10
Washita Stone.	dis 10
Slips.	dis 10
Arkansas Stone.	dis 10
Slips.	dis 10
Grindstones, Family, J. F. Green & Bro.	dis 10
Loring's.	dis 10

## Spoon Shavers.

Joseph Dixon's.	dis 10
Gen.	dis 10
Gold Medal.	dis 10

## Spoon Shavers.

Steel.	dis 10
Iron.	dis 10
Nickel Plated.	dis 10
Star Try Squares and Bevels.	dis 10
Diston's Try Squares and Bevels.	dis 10
No. 2.	dis 10
Improved.	dis 10

## Tacks.

Full Weight American Iron.	dis 10
Half Weight American Iron.	dis 10
Carpet.	dis 10
Brass American Half Weight.	dis 10
Finishing Nails.	dis 10
Trunk and Clout.	dis 10
Copper Tacks.	dis 10
Iron Shoe Nails.	dis 10
Double Pointed.	dis 10

## Tapes, Measuring.

American Tapes and Clip Co.	dis 10
Eddy's.	dis 10

## Tapes, Measuring.

American Tape Measure Co.	dis 10
Thermometers.	dis 10
Tin Case.	dis 10
Wooden.	dis 10
Wooden.	dis 10

## Tobacco Cutters.

Enterprise Mfg. Co. (Champion).	dis 10
Wood Bottom.	dis 10
All Iron.	dis 10

## Tobacco Cutters.

Finishing Nails.	dis 10
Trunk and Clout.	dis 10
Copper Tacks.	dis 10
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## Tapes, Measuring.

American Tapes and Clip Co.	dis 10
Eddy's.	dis 10

## Pot Covers.

Inc. 7 1/2.	dis 10
Per gross.	dis 10
Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Pie, Dinner or Scooped Plates.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Deep Pie Plates.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Jelly Cake Pans.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Coffee Pot Covers.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Without Tubes.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## With Tubes.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Common Square Pans (One Sheet).

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Milk Skimmers (Plain or Pierced).

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Inc.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Add \$1 per gross, or 10c per doz. to list of Pot Covers.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Tin Stove Pipe Hangers.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Jap'd or Burn'd.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Coffee Boiler Lids.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## To Rivet.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## To Solder.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## STAMPED DEEP AND RETINNED WARE.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Plain Stamped Water Dippers.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Retained Milk Pans.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Dipper Bowls, Plain Stamped.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Dipper Bowls, Retained.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Cannisters, Common.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Cannisters, Blined.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Cannisters, Square.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Candlesticks, Japanese.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Cake Boxes, Round.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Chamber Pans, Japanese.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Green, per doz.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Oak.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Toy Banks, House.

Inc. 10 1/2.	dis 10
Per gross.	dis 10

## Toy Banks, Gothic.



## Steel.

THREE  
CLASS PRIZE MEDALS.  
CLASSES 1, 21, 22,  
Great Exhibition of Industry  
LONDON, 1861.

MEDAL OF HONOUR,  
SOCIETY OF ARTS & INDUSTRY,  
LONDON, 1856.

1st CLASS  
PRIZE MEDAL, CLASS 1<sup>st</sup>  
UNIVERSAL  
EXHIBITION OF INDUSTRY  
PARIS, 1869.

**LOCKER BROTHERS**  
(Limited.)  
SUCCESSORS TO  
**SAM'L COCKER & SON,**  
(Established 1752.)  
**SHEFFIELD, ENGLAND.**

MANUFACTURERS OF  
CAST, SHEAR, SHEET AND BLISTERED STEEL, OF EVERY DESCRIPTION.  
BEST CAST STEEL WIRE, ADAPTED SPECIALLY FOR MECHANICAL PURPOSES;  
Also for ROPES, NEEDLES, FISH HOOKS, PINS, CRINOLINE, &c.

BEST CAST STEEL FILES, SAWS, EDGE TOOLS,  
HACKLES, GILLS, CARD CLOTHING, CARD TEETH, HACKLE AND GILL PINS,  
FISH HOOKS, NEEDLES, &c.

ALSO  
GENERAL MERCHANTS.

**WM. JESSOP & SONS,**  
MANUFACTURERS OF  
**STEEL,**  
AND IMPORTERS OF IRON  
SHEFFIELD, ENGLAND.

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CHICAGO: Great Adams & Co. NEW ORLEANS: Folger & Co.  
CINCINNATI: Augustus Wessel. SAN FRANCISCO: Huntington, Hopkins & Co.

**F. W. MOSS,**

Successor to JOSHUA MOSS & GAMBLE BROS.  
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MANUFACTURER AND IMPORTER OF

**STEEL AND FILES.**

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MOSS & GAMBLE SUPERIOR C. S. "FULL WEIGHT" FILES,

Cast Steel Hammers and Sledges. Also, "M. & G." Anvils and Vises.

WARRANTED CAST STEEL, especially adapted for DIES and TURNING TOOLS, DRILLS, COLD CHISELS,

PUNCHES and all kinds of MACHINISTS' TOOLS.

Celebrated Improved Mid-Centre Cast Steel, for Taps, Reamers, and Milling Tools,

warranted not to crack in hardening Taps of any size.

Swede Spring Steel, especially adapted to Locomotive and Railway Car Springs.

English Spring and Plover Plate Steel. Also, manufacturer of

Sheet Cast Steel Shear, German, Round Machinery, Hammer, Fork and Shovel Steel

And GENERAL MERCHANT.

A. M. F. WATSON, General Agent.

**WILSON HAWKSWORTH, ELLISON & CO.,**

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THE MEDAL FOR MERIT  
Awarded for Excellence & Perfection  
in Material & Workmanship.

W. H. E. & CO. have pleasure in announcing the  
Award of the MEDAL FOR MERIT for their Exhibit  
of Crucible Cast Steel, Files, Steel Wire, Tools, &c.  
This is the ONLY Award to any Exhibitor of  
STEEL WIRE in the British Section.

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Steel Wire, &c., AND GENERAL  
MERCHANTS.  
CARLISLE WORKS, SHEFFIELD, ENG.

New York, 72 John Street. Agencies: Boston, 21 Oliver Street.  
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**Isaac Jenks & Sons,**  
MINERVA AND BEAVER WORKS, WOLVERHAMPTON, ENGLAND.  
MANUFACTURERS OF

JENKS' SPRING STEEL, "MINERVA" SWEDER, AND "ANGLO" CAST SPRING STEEL;  
"JENKS" TIRE, TOE CORE, SLEIGH SHOE, BLISTER, AND PLOW STEEL;

ALSO,

"BEAVER" PLOW, TIRE, AXE, AND SHEET IRON.

VAN WART & MCCOY, Agents, 134 & 136 Duane Street, N. Y.

**J. & RILEY CARR,**  
MANUFACTURERS OF SUPERIOR  
**STEEL**

For Tools, Cutlery, Saws, Files, Augers, Gimblets, &c.; Sheet Cast Steel for  
SPRINGS AND STAMPING COLD;

ALSO THE CELEBRATED

**DOG BRAND FILES,**

Unsurpassed, if equalled in quality.

Bailey Lane Works, Sheffield, England.

Warehouse, 82 John St., New York.

Established 1810.

HENRY MOORE, Attorney.



## Steel.

**SANDERSON BROTHERS & COMPANY,**  
(LIMITED)

DARNALL WORKS,  
ATTERCLIFFE FORGE, SHEFFIELD, ENGLAND.

Sole Manufacturers of the CELEBRATED

**CAST STEEL,**

Warranted most SUPERIOR and UNSURPASSED for  
**TOOLS and GRANITE ROCK DRILLS.**

A full assortment of this universally approved OLD BRAND of  
English Steel, and

**ARMITAGE'S GENUINE MOUSEHOLE ANVILS,**

For Sale by

**EDWARD FRITH, 16 Cliff Street, New York.**

**FRANCIS HOBSON & SON,**  
97 John Street, NEW YORK,

Sole Manufact'rs of "CHOICE" Extra Cast Steel.

Manufacturers of all Descriptions of Steel.

Manufacturers of Every Kind of Steel Wire.

Don Works, Sheffield, England.

**JOHN HOGAN, Agent.**

**S. & C. WARDLOW,**

MANUFACTURERS OF THE CELEBRATED

**Cast and Double Shear  
STEEL,**

In Bars, Sheets and Coils, for fine Pen and Pocket Cutlery, Table, Carving,  
Butcher and Shoe Knives, Turning Tools, Dies, Files, Clock or other Springs,  
Saws and Tools of every variety.

SHEFFIELD, ENGLAND.

Office of S. & C. WARDLOW, 95 John Street, New York.

*In calling the attention of consumers of Steel, in  
any of the various above enumerated, we would respectfully assure  
them of our ability to supply an article that cannot be equalled in  
quality, temper, and adaptation in all respects to the various purposes  
for which it may be required. Half a century of practical expe-  
rience in all departments of Steel manufacture, a long established  
reputation in England, and the Continent of Europe, and in the Eastern  
States principally of this Country, encourage us to solicit a universal  
trial of our Steel for the above or other purposes for which a first  
class material in quality, temper, and durability is wanted.*

**G. SANDERSON & CO.,**

Manufacturers of all descriptions of

**STEEL.**

Bailey Street and  
Broad Lane Steel Works, SHEFFIELD, ENGLAND.

Particular attention is paid to quality and temper for

Files, Saws, Table and Pocket Cutlery, Augers, Shovels, &c.

ALSO STEEL of superior quality for Turning Tools, Taps, Dies, Drills, &c.

Hot and Cold Rolled Sheets for Clock Springs, Corset Clasps, Pens, &c.

Makers of the Celebrated ROCK BORING DRILL STEEL.

Warehouse, 57 John Street, New York.

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MOWBRAY STEEL WORKS, Sheffield, England.

Manufacturers of BEST CAST STEEL for Edge Tools. Also  
EXTRA CAST STEEL for Axes.

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Works and Office, NICETOWN, PHILADELPHIA, PA.

MANUFACTURERS OF

**CRUCIBLE AND OPEN HEARTH STEEL,**

Steel Locomotive Tires. Steel Axles of every description.

STEEL FORGINGS UP TO 8000 lbs. IN WEIGHT.

Solid Steel Castings, Hammer Dies, Frogs, Crossings, etc.

BEST TOOL, MACHINERY AND SPRING STEELS.

WM. SELLERS, Pres. CHAS. A. BRINLEY, Supt. MARRIOTT C. SMYTH, Sec. & Treas.

**CHROME STEEL COMPANY,**

MANUFACTURERS OF

**CHROME CAST STEEL,**

WARRANTED SUPERIOR TO ANY STEEL IN THE MARKET—EITHER ENGLISH OR AMERICAN—  
FOR EVERY PURPOSE.

Principal Office & Works, Kent Ave. and Keep St., Brooklyn, E. D., N. Y.

AGENCIES,

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Huntington, Hopkins & Co., San Francisco and Geo. Dunbar & Co., Boston, Mass.  
M. M. Back & Co., St. Louis, Mo. Wood & Leggat, Hamilton, Ont.

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**Sheffield Steel Works.**  
(Established in 1848.)

**SINGER, NIMICK & CO.**

Pittsburgh, Pa.,

Manufacturers of Extra Quality Tool

**CAST STEEL,**

Patent Rolled

**SAW PLATES,**

All descriptions of Cast and German

Spring and Plover Steel

Elliptic and Side Springs, Bent Springs.

AXLES, STEEL TIRE,

Plow Wings, Shares, Cultivators,

Reaper Bars, Low Bars, &c., &c.

Warehouse, 88 Water and 100 First Streets.

**MILLER, METCALF & PARKIN,**

**Crescent Steel Works,**

PITTSBURGH, PA.,

Manufacturers of all descriptions of

**STEEL**

EQUAL TO ANY IN THE MARKET.

Office, 339 Liberty St.,

PITTSBURGH, PA.

**Gunpowder.**

**GUNPOWDER**

**DUPONT'S**

Sporting, Shipping, and Mining  
**POWDER.**

**DUPONT'S GUNPOWDER MILLS,**

ESTABLISHED IN 1801,

Have maintained their great reputation for 75  
years. Manufacture the

Celebrated Eagle Ducking,  
Eagle Rifle, & Diamond  
Grain Powder.

THE MOST POPULAR POWDER IN USE.  
Also, SPORTING, MINING, SHIPPING, AND BLAST-  
ING POWDER.

of all kinds and descriptions.

For sale in all parts of the country. Represented  
by

**F. L. KNEELAND**

70 Wall Street, NEW YORK.

**GUN-POWDER**

**LAFLIN & RAND POWDER CO.,**

21 Park Row, New York,

Invite the attention of the Hardware Trade to their  
facilities for delivering

**Blasting, Mining and Rifle**

In every part of the United States.

From having agencies and magazines at all promi-  
nent points, beside our works at

Kingston, Newburgh, Saugerties and  
Schaghticoke, N. Y.; Moosic, Rush-  
dale and Cressona, Pa.; and  
Platteville, Wis.

The superiority is well known of our brands of  
Sporting Powder.

Orange Rifle, Orange Ducking,  
Orange Lightning.

**ELECTRIC BLASTING APPARATUS.**

SAFETY-FUSE at wholesale.

**WOODEN TOOTH**



**Curry Comb.**

The Best yet Invented.

**CHEAP AND DURABLE.**  
Is Pleasant to the Horse, and does not injure  
the Brush.

**FULLER BROS., Sole Agents,**  
89 Chambers & 71 Beade Streets, N. Y.



## Steel.

**HUSSEY, WELLS & CO.**

MANUFACTURERS OF ALL DESCRIPTIONS OF

**CAST STEEL,**

INCLUDING

Best Refined Steel for Edge Tools.

PARTICULAR ATTENTION PAID TO THE MANUFACTURE OF STEEL FOR

**Railroad Supplies, Homogeneous Plates**

FOR LOCOMOTIVES, BOILERS AND FIRE BOXES,

Smoke-Stack Steel, Cast Steel Forgings for Crank Pins, Car Axles, &amp;c.

ALSO, MANUFACTURERS OF THE CELEBRATED BRAND

**"Hussey, Wells & Co. Cast Spring Steel,"**

For Elliptic Springs for Railroad Cars &amp; Locomotives.

PENN AVENUE and SEVENTEENTH ST., PITTSBURGH, PA.

BRANCH OFFICES:

30 Gold St., New York.

7 Hamilton St., Boston.

146 E. Lake St., Chicago.

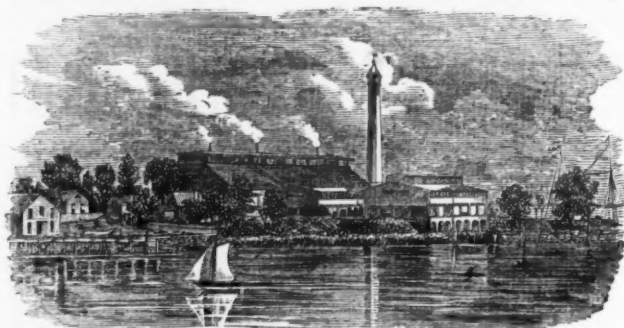
**ANDERSON & WOODS,**

MANUFACTURERS OF

**Best Refined CAST STEEL.**

CAST AND GERMAN PLOW and SPRING STEEL.

FIRST AVENUE AND ROSS STREET, - - - PITTSBURGH, PA.

**FARIST & WINDSOR,**BRIDGEPORT, CT.,  
1872.WINDSOR LOCKS, CT.,  
1860.

ALL DESCRIPTIONS OF

**CAST STEEL**

made to order for Cutlery, Dies, Agricultural Implements, Decarbonized Steel, Frog Plates and Points, Steel Forgings to Pattern. Quality equal to the best. Prices as low as the market admits.

JOEL FARIST.

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LABELLE STEEL WORKS.

**SMITH, SUTTON & CO.,**

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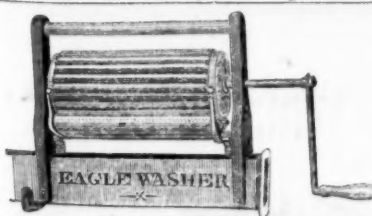
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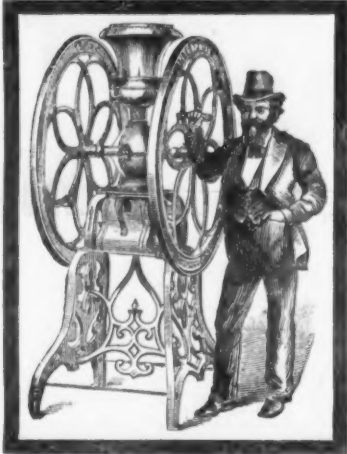
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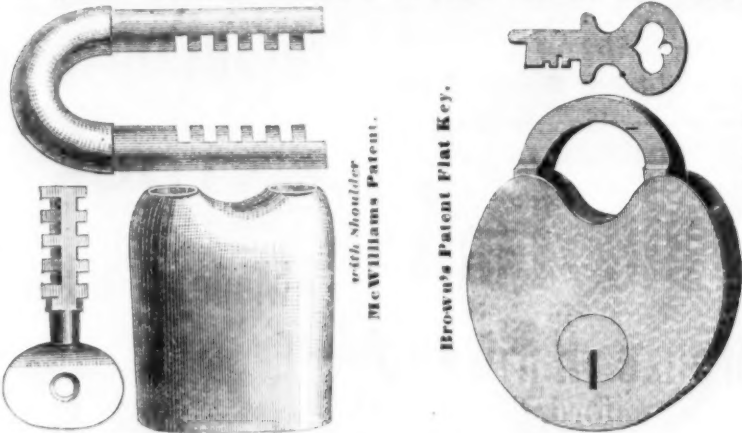
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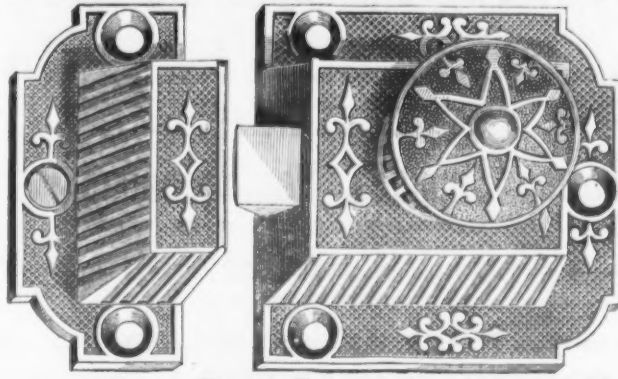
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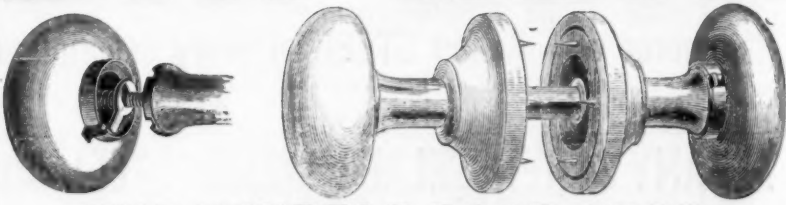
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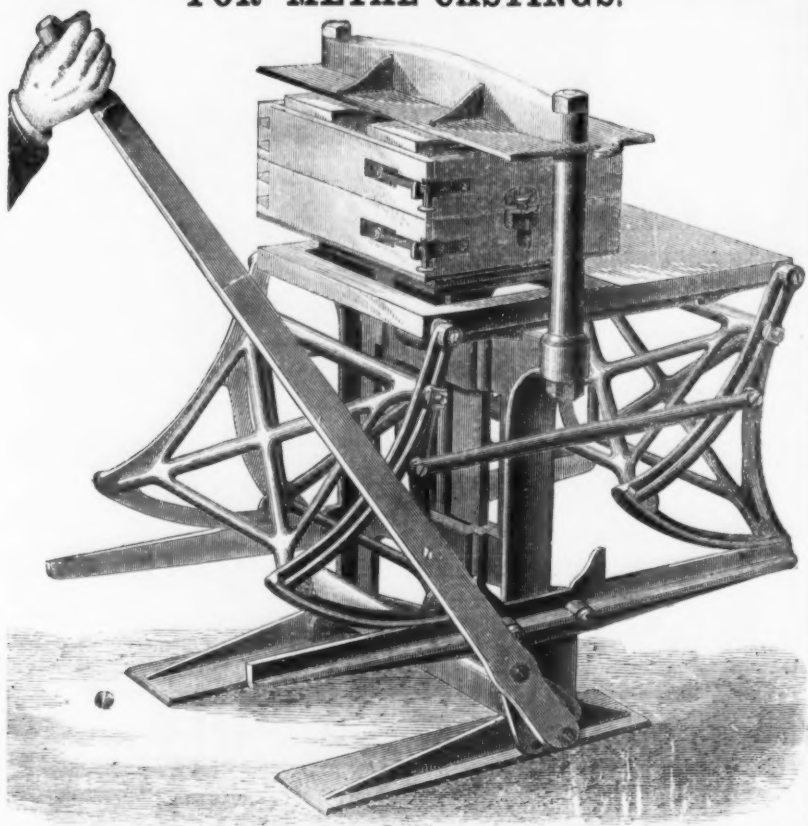
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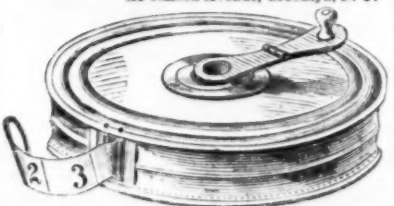
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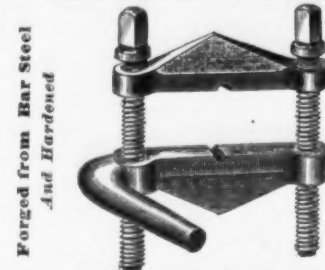
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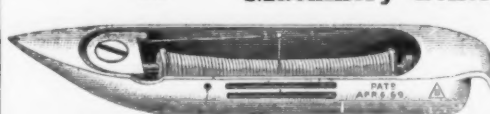
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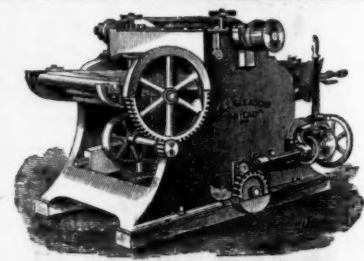
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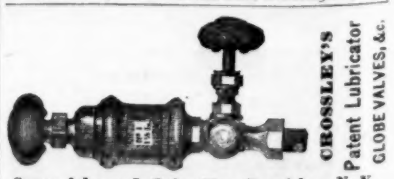
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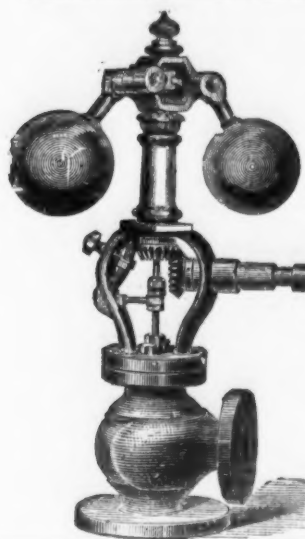
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We will put our Governor on any Engine, and guarantee it to prove itself superior to all others. If, after a fair trial, it does not, we will take it off at our own expense.

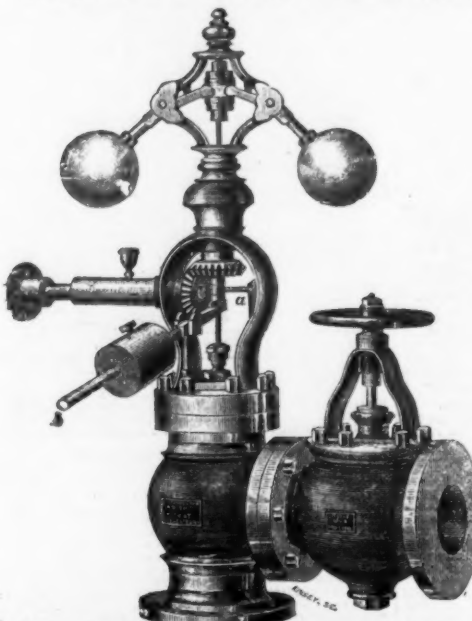
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Circulars sent free

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Capacity of Valve or Diameter of Steam Pipe in inches.	Price, Black.	Price, Bright Finish.	Price, Portable.	Price of Lever Attachment for altering speed.	Price of Stop Valve.
1/2	18 00	20 00	17 00	..	..
3/4	20 00	22 00	19 00	..	..
1	22 00	24 00	21 00	..	..
1 1/4	24 00	26 00	23 00	..	..
1 1/2	26 00	28 00	25 00	..	..
1 3/4	28 00	30 00	27 00	..	..
2	30 00	32 00	29 00	..	..
2 1/4	32 00	34 00	31 00	..	..
2 1/2	34 00	36 00	33 00	..	..
2 3/4	36 00	38 00	35 00	..	..
3	38 00	40 00	37 00	..	..
3 1/4	40 00	42 00	39 00	..	..
3 1/2	42 00	44 00	41 00	..	..
3 3/4	44 00	46 00	43 00	..	..
4	46 00	48 00	45 00	..	..
4 1/4	48 00	50 00	47 00	..	..
4 1/2	50 00	52 00	49 00	..	..
4 3/4	52 00	54 00	51 00	..	..
5	54 00	56 00	53 00	..	..
5 1/4	56 00	58 00	55 00	..	..
5 1/2	58 00	60 00	57 00	..	..
5 3/4	60 00	62 00	59 00	..	..
6	62 00	64 00	61 00	..	..
6 1/4	64 00	66 00	63 00	..	..
6 1/2	66 00	68 00	65 00	..	..
6 3/4	68 00	70 00	67 00	..	..
7	70 00	72 00	69 00	..	..
7 1/4	72 00	74 00	71 00	..	..
7 1/2	74 00	76 00	73 00	..	..
7 3/4	76 00	78 00	75 00	..	..
8	78 00	80 00	77 00	..	..
8 1/4	80 00	82 00	79 00	..	..
8 1/2	82 00	84 00	81 00	..	..
8 3/4	84 00	86 00	83 00	..	..
9	86 00	88 00	85 00	..	..
9 1/4	88 00	90 00	87 00	..	..
9 1/2	90 00	92 00	89 00	..	..
9 3/4	92 00	94 00	91 00	..	..
10	94 00	96 00	93 00	..	..

No Charge for Boxing & Carriage.

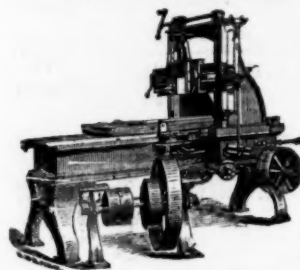
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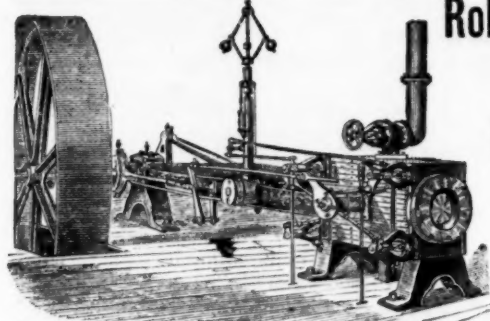
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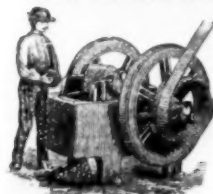
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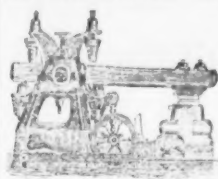
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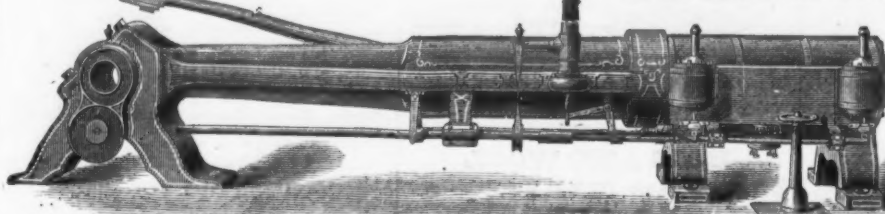
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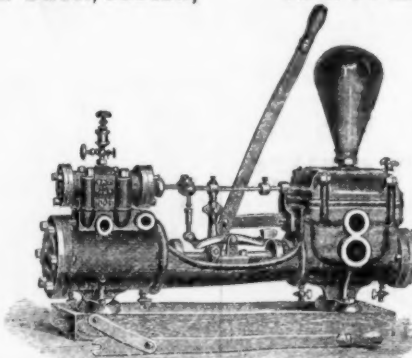
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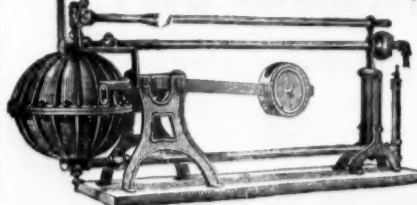
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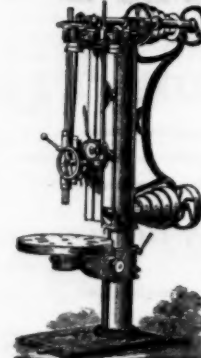
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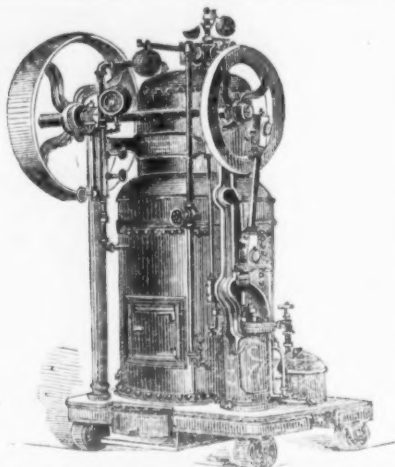
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\$200.00.Cheaper than any Engine offered of  
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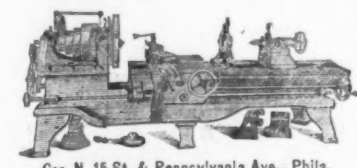
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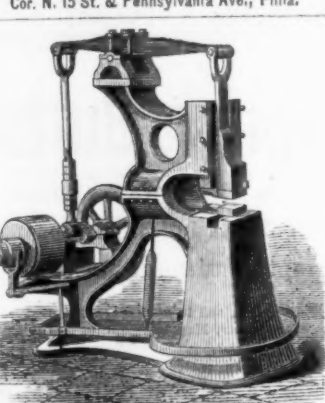
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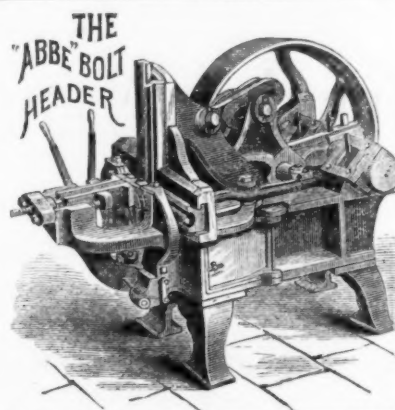
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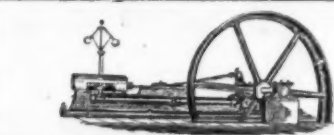
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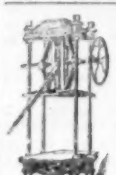
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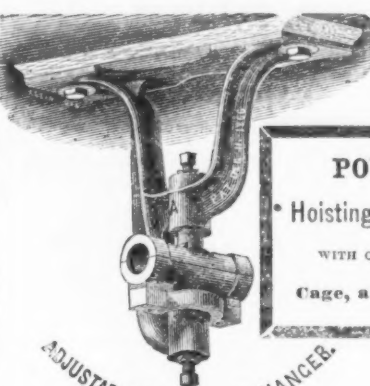
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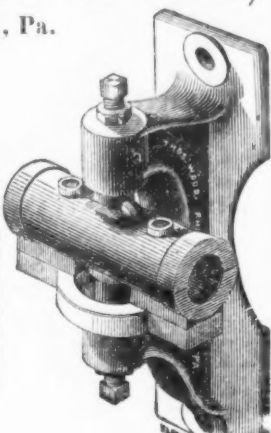
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Hoisting Machines,

WITH OR WITHOUT

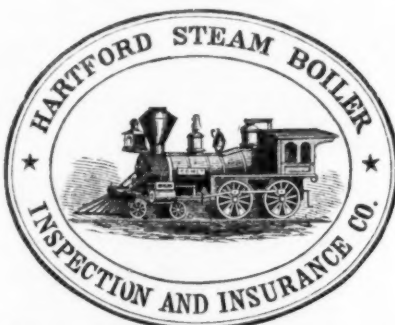
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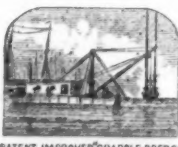
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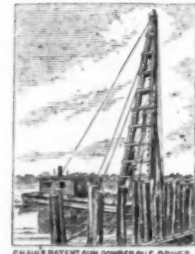
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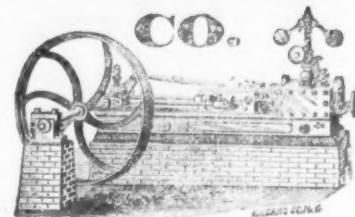


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BUILDERS OF STEAM DREDGING MACHINES,  
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STATIONARY &amp; PORTABLE

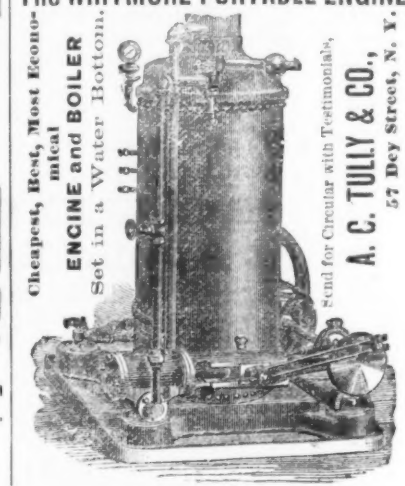
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Cheapest, Best, Most Econo-  
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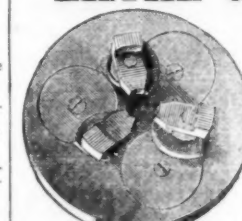
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Its working parts are  
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are adjustable with a  
range the full diam-  
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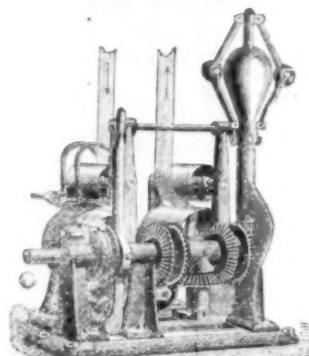
## DIFFERENTIAL GOVERNOR.

The HARTFORD GOVERNOR CO.,

Sole makers of the

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Powerful, positive, radically new. Introd. red and  
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760 South Broad Street, PHILADELPHIA.

### PAUL S. REEVES,

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## ANTI-FRICTION METALS.

XXX Genuine.....	40c	C.....	30c
XX.....	35c	D.....	15c
X.....	30c	E.....	10c
A.....	25c	F.....	11c

"Note."—The above are my standard mixtures, and have given satisfaction wherever used, but I am prepared to make Anti-Friction Metal of any quality or mixture desired by the purchaser.

BRASS CASTINGS, 21 to 35c.      INGOT BRASS, 19 to 28c.      BRASS TURNINGS AND OLD METALS WANTED.

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MADE EXCLUSIVELY FROM

SWEDISH STOCK, OIL-TEMPERED and WARRANTED.

Swedish Tire, Toe, Blister and Spring Steel.

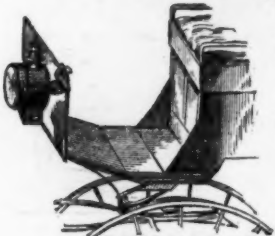
CAST SPRING AND PLOW STEEL.  
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RE-ROLLED NORWAY SHAPES.  
NORWAY NAIL RODS ROLLED AND SLIT FROM SUPERIOR BRANDS.

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FOR NIGHT DRIVING.



throws a powerful Light 100 feet ahead of the horse. Burns Kerosene without a chimney for 10 hours after one filling.  
Fits any shaped Dash or on any vehicle. Splendid Barn Lantern;  
Also good for Deer Hunting.  
The light is not affected by wind, rain or jolting. No person should be without one.

Price \$6, C. O. D., with privilege of examining. Address, WHITE MFG. CO., Bridgeport, Conn.

A liberal discount to dealers. Send for Circular. See illustrated article in The Iron Age of Oct. 14.

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PATENTED JULY 25, 1871.

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In this Strap the liability of the leather to stretch and become loose and porous is prevented by the use of a patented non-extensible base, which supports the leather and secures

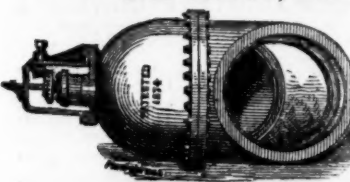
PERMANENT ELASTICITY.

We make this style with single rod, double rod, and wood frames, and intend that it shall, in quality compare favorably with our other well known brands.

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For Water, Gas and Steam,



From 2 in. to 50 in. diameter.  
Also, Fire Hydrants, Single and Double Nozzle.  
Improved Boiler Feeders, Etc.  
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Bolts, Nuts, Turnbuckles, Washers, Forgings, &c.

The attention of large consumers solicited.

R. E. NEIL, President.

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COLUMBUS, OHIO,

Manufacturers of BEST NORWAY IRON  
Carriage, Steeple, Cone, Shackle, Elliptic, Shaft and Tire



All the different styles used by the manufacturers of the finest Carriages. Every Bolt warranted true to size and fit. Illustrated Price Lists mailed on application. Our facilities are unsurpassed for the manufacture of Machine Bolts and Coach Screws. Correspondence from Car, Bridge and Machinery Builders solicited.

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Great Reduction in Time and Labor to the Farmer by using



Nellis' Original HARPOON HORSE HAY FORK,

Grapple and Pulleys; also, Nellis' Patent Stacker and Conveyor for Hay, Straw, &c. A ton of Hay can be delivered in three to five minutes to any part of Mow or Stack. The right of Stacker and Conveyor granted free to the Farmer purchasing our Horse Hay Fork and Fixtures during season of 1875.

Nellis' Grapple. With it Pulleys can be attached or detached to rafters or beam, without the use of a ladder.

NELLIS' PULLEY, Improved Wrought Frame, Prepared Wood Wheel. Warranted superior to any Horse Fork Pulley offered in the market.

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Of Agricultural Steel & Iron, Steel Tempered by Nellis' process to suit every kind of soil.

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Manufacturer of the



Each mouse caught resets the Trap for another.

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A Substitute for Steel and Wrought Forgings.

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Security, Durability, Convenience.



IMPROVED SELF-LOCKING

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Made in the most substantial and compact manner, and are in every respect a superior article. We guarantee that no two locks are alike, unless specially ordered. Each lock furnished with two keys. Any number of locks or keys made to order. Adopted by the United States Government. Samples of No. 1 Lock sent to all parts free on receipt of \$1.75. Liberal Discounts to the Trade.

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Lamps, Bronzes,

Equal to any made, in great variety, all of our own manufacture.

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Manufacturer of Brass Work for Water, Gas and Steam. Brass Castings and Jobbing promptly attended.

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## DIXON'S Carburet of Iron STOVE POLISH.

47 Years in Market.

For stove dealers we put up the genuine DIXON'S STOVE POLISH in 25 and 50 lb. boxes for sale by the pound.

All information furnished freely on application by letter to

THE JOS. DIXON CRUCIBLE CO.,  
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Carriage, Tire, Plow, Stove

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## BOLTS.

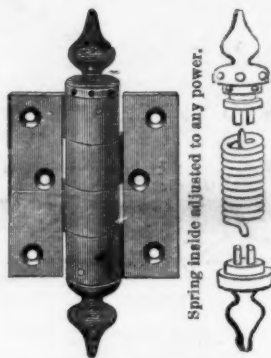
Carriage Bolts made from Best Square Iron, a Specialty.

THE

## American Spiral Spring Butts

Swing doors either way, allowing continual passing, and close them promptly, without noise.

Invaluable in cold weather, and in summer can be used as ordinary hinges.



SINGLE ACTION BUTT, SWINGS DOOR ONE WAY.

Very Desirable

FOR

Stores, Banks & Churches,

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Outside Winter Doors.

Used on the

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Patent Office,

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DOUBLE ACTION BUTT, SWINGS DOOR BOTH WAYS.

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SILVER PLATED SPOONS & FORKS.

They are plated by weight, and not by time or guess, containing 20 per cent. more silver than the usual standard, on a base of Nickel silver, and finished by hand. Each article is guaranteed by the trade mark and warranted to give full satisfaction. We ask of the trade a fair and impartial test, assuring you that the high standard already attained, shall be maintained. Send for Catalogue and Price.

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Noiseless Double Action Butt, as seen upon a door, swinging it both ways.

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